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CONTENTS

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THE SYRPHIDAE constitute one of the few large families of Diptera or two-winged flies which, viewed from an economic standpoint, are of great benefit to man. The benefits which accrue to man from the activities of these insects are varied in nature, but undoubtedly the most important role they play is that of reducing the tremendous numbers of plant lice. Wadley (1931) who studied the plant louse *Toxoptera graminum* during its outbreak in Minnesota in 1926 when thousands of acres of oats were destroyed, places syrphids second only to ladybird beetles or coccinellids as enemies of this plant louse. Fluke (1929) considers them on a par with Coccinellidae as the most important predaceous insects attacking the pea aphid, another plant louse that seriously injures canning peas. If it were not for the presence of syrphid flies and ladybird beetles in Minnesota the problem of aphid control would probably be the greatest insect problem of the state.

It is the larval stages of syrphid flies that prey upon plant lice. If one takes the trouble to observe a syrphid larva feeding, and records the number of plant lice that a single one will consume in one day, he will be astounded at its voraciousness. Wadley records that one syrphid larva consumed 94 plant lice in one day. A moderate population of syrphid larvae feeding day after day will thus greatly reduce the number of plant lice. It often happens that syrphid larvae together with other natural enemies of plant lice are numerous enough to hold a plant-louse population in check from the beginning of a season so that plant lice never appear in great numbers. In other instances the natural enemies may be few in numbers at the beginning of the year, but increase greatly as the season progresses and bring an injurious population of plant lice under control. Several of the species of plant-louse-eating syrphids occur in great numbers. When one considers that approximately 45 of the 135 species of syrphids known from the state feed on plant lice, one gains some slight idea of the good work they can do for man and his crops by feeding on the plant-louse population.

The adult flies, commonly known as hover flies or flower flies, are also of considerable benefit to humanity. Their principal value lies in their being pollinators of plants. The flies themselves commonly visit flowers. Their bodies are hairy and

the flower pollen sticks to the hairs. As they fly from flower to flower some pollen is left at each and new pollen taken up involuntarily. This results in cross pollination or cross fertilizing of the blossom so that it produces fruit or seed. The blossom would not produce without the aid of the syrphid fly or some other insect in transmitting the pollen.

Syrphids are also of economic importance in other respects. They are of value as scavengers; the larvae, feeding on decaying animal and vegetable matter, remove large amounts of waste material which otherwise would be a nuisance to man. Certain species of syrphids have been used by scientists in the laboratory in the study of the physiology of insects, in genetics, and in cytology. Syrphid larvae have been reported as feeding on the bulbs of certain plants, but in most of these cases they have been shown to be secondary in nature and not primarily attacking plants. They have also been reported as facultative internal parasites of man and animals; their importance in this role is of much less significance than is the case with many other groups of flies.

Fifty-two genera and 135 species of syrphids are known to occur in Minnesota. No comprehensive monograph of the group for the United States is available. There are numerous generic revisions and descriptions of new species scattered throughout many publications. The most important of these are listed in the bibliography at the end of this bulletin. It is the purpose of this bulletin to give an account of the Syrphidae or hover flies of Minnesota with reference to their identification, economic importance, biology, and geographical distribution. Keys to subfamilies, genera, and species are presented; information on the biology of each genus, and some of the species, is presented. The study is based on several thousand specimens of syrphid flies collected in Minnesota and deposited in the insect collection at University Farm. In the discussion of the individual species only the original description and the more important references are cited. During the course of the study four new species were discovered and these are described. In the preparation of the keys and the compilation of the biological data the work of previous investigators has been freely drawn upon.

The most comprehensive paper dealing with North American Syrphidae is that of Williston (1886) but, as pointed out by Curran (1934), less than half of the described North American species are now included in his monograph. This indicates the extent of the knowledge gained since the publication of Williston's work. The most recent and most nearly complete monograph of the foreign species is Sacks' "Die Fliegen der Palaearktischen Region" (1928-1932). Other exotic works worthy of mention are

Shiraki's "Die Syrphiden des Japanischen Kaiserreichs, mit Berücksichtigung benachbarter Gebiete" (1930) and Gil Callado's "Monografia de los Sirfidos de Espana" (1930). Any serious student of the Syrphidae will find Williston's "Synopsis of North American Syrphidae" (1886), Verrall's "British Flies" (1901), Lundbeck's "Diptera Danica" (1916), and Curran's "Contribution to a Monograph of the American Syrphidae from North of Mexico" (1925d), indispensable in the study of the group. The literature on the biology and developmental stages of the Syrphidae is voluminous and scattered. The principal workers are Metcalf, Fluke, Verrall, Jones, Lundbeck, Krüger, and Heiss. A recent publication by Heiss (1938) describes and figures the immature stages of many American species.

The author wishes to express his indebtedness to Dr. C. E. Mickel as adviser to this problem, for his helpful criticisms, and for his critical reading of the manuscript; to Dr. C. H. Curran for checking the determinations on doubtful specimens; and to Dr. C. L. Fluke for loan of material.

GENERAL BIOLOGY

The life histories of most of the North American Syrphidae are known, although there are numerous species whose normal feeding habits are yet to be discovered. For example, one of the most common species, *Mesogramma marginata* (Say), usually comprising the majority of specimens in any random sample of collecting, has rarely been seen as a larva and the normal host is probably yet unknown.

The larvae of the family can be classified into several types. This is equally true of the adult forms, but it is apparently impossible at the present time to make any extensive correlation of larval types with adult types. This applies especially to subfamily categories. The family itself is clearly defined and easily distinguished from other closely related families, but the present classification of the adults into subfamilies appears to be unnatural and up to the present time attempts toward a natural classification have been unsatisfactory. For example, the "rat-tailed" or long-tailed type of larva, so called because of the length of the posterior respiratory appendage, is present in at least four subfamilies, viz., Eristalinae, Cheilosinae, Heliophilinae, and Sericomyinae. Thus one type of larva is correlated with several types of adult flies, while other flies of the same subfamily may have still other types of larvae. Correlations between the habits of the larvae and adults are even more difficult to ascertain. The entomophagous forms are found in the subfamilies Syrphinae and Cheilosinae. The commensal species (those living in the

nests of various Hymenoptera) are found in the subfamilies Syrphinae, Volucellinae, Microdontinae, and possibly Cheilosinae. The species obtaining their sustenance from decaying animal matter are found in the subfamilies Heliophilinae, Eristalinae, Volucellinae, and the genus *Microdon* (?), while those feeding on living or dead plant material are represented in probably all of the subfamilies.

This indicates in general how little correlation exists between the habits of the larvae and the adult classification of the subfamilies. Much more must be known about the habits and structures both of the adults and their developmental stages before any satisfactory classification can be made.

The literature available for the determination of the immature stages is scarce and incomplete. Metcalf (1913b) constructed a key for the larvae and puparia of the known species of Ohio, which included fourteen species and eleven genera. Fluke (1929) proposed a key for the larvae of eight genera and seventeen species of syrphids known to be predaceous to the pea aphid. The key was based entirely upon characters of the posterior respiratory organ. Vimmer (1912) presented a key for the puparia of eight genera, and in 1933 proposed a key to fifteen genera of larvae and a key to seventeen genera of puparia. In his studies on aquatic Diptera, Johannsen (1935) presented a key to the larvae and puparia of seventeen genera which are found in aquatic or semi-aquatic habitats. Heiss (1938) has recently published a monograph on the classification of the larvae and puparia of the syrphid fauna of Illinois, exclusive of aquatic forms. It contains keys to the known genera and species with descriptions of their immature stages.

The Egg

The eggs have a more or less characteristic appearance in most of the known species of this family, regardless of the wide diversity of habits and structures manifested in the other stages of their development. Metcalf (1916), described them as follows:

> "They are chalk-white, shiny, elongate-ovate or subcylindrical with rounded ends. The micropylar end more truncate, slightly humped above, commonly about 1 mm. (1/25 inch) long by a third of a millimeter in diameter . . . . . However, when viewed under a microscope the characteristic thing appears; viz., a delicate and beautiful sculpturing of the shell (chorion) consisting typically of elevated oval areas (bodies) separated by depressed areas, but each elevation surrounded by radiating and interlacing, sometimes branched arms, also elevated, which they give off into the depressed areas and which often completely cover the latter with a fine elevated network."

The eggs are usually deposited in the proximity of available food suitable for the developing larvae, among aphids, on or near

decomposing plant or animal matter, near crevices of trees where there is an exudation of sap, in nests of various Hymenoptera, or near stagnant water, depending upon the habit of the species. Curran (1925d) states:

"The method of oviposition of several species of Syrphidae belonging to widely separated genera has been studied by the author, and the observations bear out those made for other families, viz.: that forms in which the larvae are predaceous upon exposed insects usually lay their eggs singly, while the number of eggs increases until, in those forms living in more or less liquid substance, is very high and may be over 150. There are, of course, exceptions."

The Larva

The larvae of Syrphidae present a wide diversity of forms which do not lend themselves easily to segregation into distinct groups. Earlier workers have proposed to group them in four types, and in a general way these types are useful in classification, but the larvae of many species vary widely from the accepted type. The four proposed types are: (1) the *Microdon* type, (2) the aphidophagous type, (3) the short-tailed type, and (4) the long-tailed type.

THE MICRODON TYPE: The larvae of the subfamily Microdontinae are immediately recognizable by their hemispherical contour, absence of segmentation, short posterior respiratory tube, sluggish movements, and their resemblance to certain molluscs for which they have often been mistaken. They are usually found within the nests of ants.

THE APHIDOPHAGOUS TYPE: Within this group are represented most of the larvae of the subfamily Syrphinae, a few larvae of Cheilosinae, and perhaps those of a few Heliophilinae. They are undoubtedly the most common larvae observed; most of them feed upon aphids and other soft-bodied Homoptera. They are leech-like, subcylindrical and attenuated anteriorly; their posterior respiratory process is short; segmentation is distinct.

THE SHORT-TAILED TYPE: This class is rather poorly defined; intergradations into either the aphidophagous or the long-tailed types are common, making many of the species difficult to place. The body is cylindrical; the posterior respiratory process short. Most of the forms which feed upon decomposing plant material belong to this group. Representatives are principally in the subfamilies Heliophilinae and Cheilosinae.

THE LONG-TAILED TYPE: Within this group are the so-called "rat-tailed" maggots or filth-inhabiting forms. As their name implies, they are readily recognized by the relatively long posterior respiratory tube. Although this type of larva is most commonly found in the subfamilies Eristalinae, and Sericomyinae,

it is also found in the subfamilies Cheilosinae and Heliophilinae. In general it resembles the short-tailed type with the exception of the length of the respiratory tube.

In spite of their variability, the larvae of the family taken as a whole maintain certain characters which are universally common. Their integument is tough, rather roughly corrugated or transversely wrinkled, with minute spine-like projections. The body is composed of twelve segments, although in some species segmentation is obscured. The respiratory appendage consists of a pair of tracheal tubes more or less closely united and situated at the caudal end of the body. It may vary from relatively short to several times the length of the larval body. Paired spiracles are located at the tip of the respiratory appendage.

The Puparium

The skins of the last two larval instars are not cast off as in many insects, but are retained around the body of the mature larva; the next to the last or outermost one becomes hard and brown, and serves as a protective covering for the pupa. The pupal stage is usually passed near the normal habitat of the larva. In the genus *Microdon* it closely resembles the larva but is more hemispherical, in the aphidophagous forms it is gradually enlarged toward the anterior portion and assumes a drop-like shape. The puparia of the long and short-tailed forms resemble the larva in contour, but are slightly enlarged anteriorly; the distinguishing characteristic of these forms is the relative length of the posterior respiratory tube.

ECONOMIC IMPORTANCE

The larvae and adults are of economic importance as (1) predators of insects, (2) plant pollinators, (3) plant feeders, (4) scavengers, (5) parasites, and (6) laboratory animals.

Predators of Insects

Quantitative studies upon the actual number of aphids eaten by a single larva is of particular interest in evaluating their importance as predators. Davidson (1922) in his work on various species of *Melanostoma* found that *Melanostoma obscurum rostratum* Bigot consumed a total of 278 aphids during the third and fourth instars; the same species consumed a total of 282 aphids during the third, fourth, and fifth instars, and during its total larval life consumed 346. The aphids used were *Myzus rosarum* Walker and *Rhopalosiphum nervatum* Gillette in the first two experiments and *Myzocallis bella* (Walsh) and *M. alhambra* Davidson for the third experiment. Curran (1925d) observed that in five of the more common aphidophagous forms the average daily consumption varied from 15 to 47 aphids and

the total aphids eaten by one larva varied from 265 to 530. In his work on *Toxoptera graminum* in Minnesota, Wadley (1931) observed that *Syrphus americanus* Wiedemann=*Metasyrphus wiedemanni* (Johnson) destroyed 440 to 472 aphids and *Allograpta* (probably *obliqua* Say) 242-270 during their larval development. Fluke (1929) observed that *Sphaerophoria scripta* (Linné) devoured from 110 to 140 pea aphids during its larval life. These differences in the number of aphids consumed may be accounted for in the different sizes of both aphids and larvae chosen. From these data it is apparent that syrphid larvae are capable of destroying great numbers of aphids, and when abundant are of great value to the farmer. The various species concerned in this phase of study will be considered under the biological discussion of the various genera.

Plant Pollinators

The value of the adult flies as pollinators of plants depends upon two factors: the vestiture of the body and the flower-visiting habit of the species in question. There seems to be little evidence of any specificity of a particular species to any particular plant, although Curran (1925d) believed the group as a whole to be attracted especially to white flowers. This has been verified in a general way by the author's observations. The genera *Epistrophe, Metasyrphus, Syrphus, Mesogramma, Sphaerophoria,* and *Cheilosia* are exceedingly abundant upon flowers of *Angelica.* Wild plum, sweet clover, rosinweed, blossoming fruit trees, milkweed, dogbane, and goldenrod are all favorite hosts. The densely pilose species are much better adapted for the dissemination of pollen, while the more glabrous forms may be considered of lesser importance. Nevertheless, the fact that all syrphids are common frequenters of flowers makes them all potential agents for pollen dissemination.

Plant Feeders

Although there have been numerous reports that various syrphid larvae are harmful to vegetation, the European narcissus bulb fly, *Merodon equestris* (Fabr.), is the only species that is actually a serious pest. This species is not known to occur in Minnesota but is restricted to the east and west coasts of North America. Other species reported as pests are *Citibaena* spp. (=*Eumerus*), *Mesogramma polita* (Say), and *Cheilosia* spp.

Scavengers

Certain species of syrphid larvae may be considered of value comparable to various muscoids which are carrion feeders, or the numerous insect species which feed upon dead plant and animal matter. The fact that the larvae are commonly found in decaying leaves, wood, manure, carrion, and similar sub-

stances gives substantial evidence that they are a factor in hastening the decomposition of certain undesirable substances.

Parasites

The occurrence of syrphid larvae as facultative internal parasites of man and animals is not a rare phenomenon. The source of infection has been in most cases from contaminated water or from partially decomposed food. At present there have been twenty-seven cases of myiasis of man and animals reported in the literature. Of these, twenty-two were found infesting the digestive tract and one the nostrils of man; four were cases from cows, three vaginal and one, a fatal case, from the intestine. Since "rat-tailed" maggots are commonly found in stagnant water easily accessible to certain domesticated and wild animals, it is not unlikely that many animals become infected and remain unobserved.

Bloomfield (1900) recorded *Scaeva pyrastri* (Linné) as a parasite of the pupa of *Plusia* sp. His observations are highly questionable since this species is normally aphidophagous and such divergence from the normal feeding habit is quite unlikely to have occurred.

Laboratory Animals

The adult of *Eristalis tenax* (Linné) has proved to be a most suitable organism for the study of certain phases of the physiology of insect sight, as shown by the work of Dolley and Farris (1929-1930), Dolley and Wierda (1929), and Mast (1923). The larvae of this and related species have been of importance in the study of the mechanics of respiration and to a lesser extent, excretion; the principal workers are Dunavan (1929), Dolley and Farris (1929), and Alsterberg (1934).

The Syrphidae have been of some value in the sciences of genetics and cytology, although little work has been done. Gabritschevsky (1924) investigated the factors of the inheritance of color varieties of *Volucella bombylans* (Linné), and Keeler (1926) elaborated further on his data. Metz (1916) in his work on the paired association of chromosomes of Diptera, made observations on the relative size, number, and shape of the chromosomes of eight species of syrphids.

NATURAL ENEMIES

Undoubtedly the most important natural enemies of the family belong to the Hymenoptera, of which the ichneumonoids and the chalcidoids are the most outstanding. The author has reared numerous specimens of *Diplazon laetatorius* (Fabr.) and *Pachyneuron allograptae* Ash.; the former species was taken from the puparia of *Metasyrphus wiedemanni* (John.) and *Syrphus ribesii*

(Linné); the latter from *Eupeodes volucris* Osten Sacken. Sanders (1911) described *Tropidopria conica* (Fabr.) (= *Diapria conica* Fabr.) from the larva of *Eristalis tenax* (Linné). Kamal (1926a) made a study of the parasites of the aphidophagous syrphids and described the life histories of fourteen species belonging to six genera. Kamal (1926b) in a subsequent paper added another genus to this list. Heiss (1938) recorded the known parasites of eighteen species of Illinois syrphids. The following genera have been known to be parasites of hover flies: *Diplazon, Syrphoctonus, Homotropus, Zamecrotoridea,* and *Rhembabuis* of the Ichneumonidae; *Pachyneuron, Bothriothorax, Eupteromalus,* and *Syrphophagus* of the Chalcidoidea; *Callaspidia* and *Aspicera* of the Cynipidae; *Conostigmus* and *Diapria* of the Proctotrupoidea.

Bhatia and Schaffi (1932) reported the larva of *Chrysopa* sp. feeding upon the eggs and larvae of *Baccha pulchifrons* Aust. while the latter were observed breaking down and devouring the stalked eggs of the former.

Certain plants are known to be enemies of the adult flies. Metcalf (1913b) has observed numerous flies caught by the pollinia of the common milkweed, *Asclepias.* Ofttimes one may observe the yet intact pollinia attached to the legs of those specimens fortunate enough to escape. Osburn (1920) observed numerous specimens of *Mesogramma marginata* (Say) caught by the flowers of *Apocynum,* or dogbane. Mr. D. G. Denning sent to the author plants of this genus on which a large number of this species were caught by the proboscis. As no other species were found on this plant it is quite evident (as Osburn states) that only the smaller or weaker species are caught by it.

Since the adults of *Eristalis* and *Elophilus* are exceedingly abundant on the flowers of goldenrod in early fall, and these flowers are the favorite hiding place for phymatids or ambush bugs, they are a potential enemy. Certain specimens in the Minnesota insect collection indicate that *Eristalis tenax* (Linné) is sometimes the prey of *Phymata pennsylvanica* Handl.

BIOLOGICAL SUMMARY AND SYNOPTIC REVIEW OF MINNESOTA SYRPHIDAE

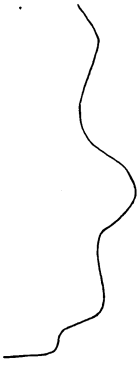
The Syrphidae form a part of the suborder Cyclorrhapha and the series *Aschiza.* In general the adults may be distinguished by the presence of a spurious vein between veins R_{4+5} and M_{1+2}. Other general characters which are common to the family are: head more or less hemispherical; eyes holoptic in the male, bare or pilose; face broad, sometimes excavated below antennae, tuberculate, carinate, or produced below, glabrous, pollinose or pilose; frontal lunule absent or rudimentary; antennae three segmented,

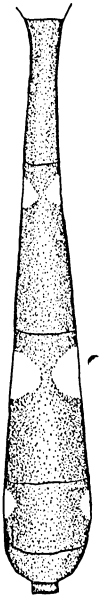
the third with a dorsal or terminal arista, the latter bare or plumose; thorax well developed, somewhat arched; squama variable in size, usually large, sometimes pilose; abdomen composed of four to six segments; male genitalia inconspicuous, asymmetrical; legs of average length, sometimes enlarged; wings relatively large, cell R_1 open or closed; anal cell always closed before the border of the wing.

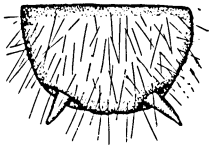
They are extremely variable in size, color, and vestiture. Intergradations in size are known from 3.5 mm. (*Sphegina*) to 21 mm. (*Milesia*) in length; the vestiture varies from practically bare to densely pilose species resembling bumblebees. Yellow and black are the predominating colors; the yellow is generally restricted to stripes on the abdomen and to a lesser extent on the pleurae. The hovering habit is generally universal to the family; it is not uncommon to observe an individual suspended apparently motionless in mid-air for several seconds and then suddenly dart away to continue the maneuver. This makes them extremely difficult to capture and it is only with difficulty that one is able to take them on the wing.

Key to Subfamilies

1. Antennae situated on a distinct pedicle; antennae with a terminal style ..... CERIOIDINAE
   Antennae not on pedicle; antennae with dorsal arista 2
2. Antennae elongate; stigmatical crossvein present; vein R_{4+5} with free branch projecting into cell R_5 ..... MICRODONTINAE
   Stigmatical crossvein absent in forms having elongate antennae; no free branch extending into cell R_5 3
3. Humeri without pile; abdomen with five visible segments ..... SYRPHINAE
   Humeri pilose; abdomen of males with four visible segments exclusive of hypopygium 4
4. Vein M_{1+2} recurrent at distal end; arista densely plumose; face protruding downward ..... VOLUCELLINAE
   Vein M_{1+2} parallel with wing margin or, if recurrent, arista is bare 5
5. Anterior bases of femora with black setulae; vein R_{4+5} deeply bent into cell R_5 ..... ERISTALINAE
   Anterior bases of femora without setulae 6
6. Large black and yellow species, 18-21 mm. in length; three broad yellow transverse bands on thoracic dorsum, first two broadly interrupted ..... MILESINAE
   Less than 18-21 mm. in length; yellow markings on thoracic dorsum restricted to spots or absent 7
7. r - m crossvein situated before middle of cell M_2 ..... CHEILOSINAE
   r - m crossvein situated at or beyond the middle of cell M_2 8
8. Arista bare or slightly pubescent ..... HELIOPHILINAE
   Arista pilose ..... SERICOMYINAE







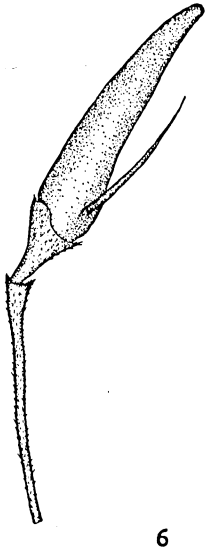
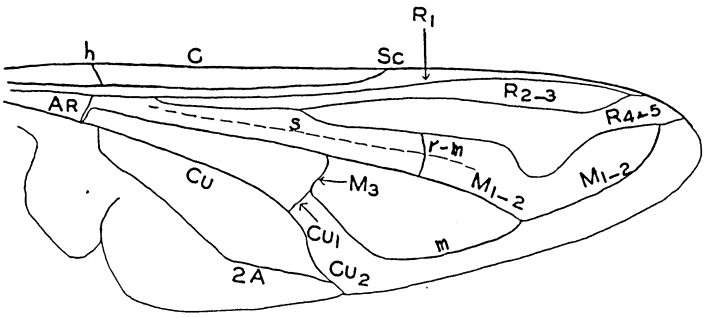


Fig. 1. Facial profile of *Cheilosia angelica* new species. Fig. 2. Facial profile of *Cheilosia cottrelli* new species. Fig. 3. Facial profile of *Cheilosia minnesotensis* new species. Fig. 4. Abdomen of *Baccha fascipennis* Loew (female). Fig. 5. Scutellum of *Microdon robusta* new species. Fig. 6. Antenna of *Microdon robusta* new species.



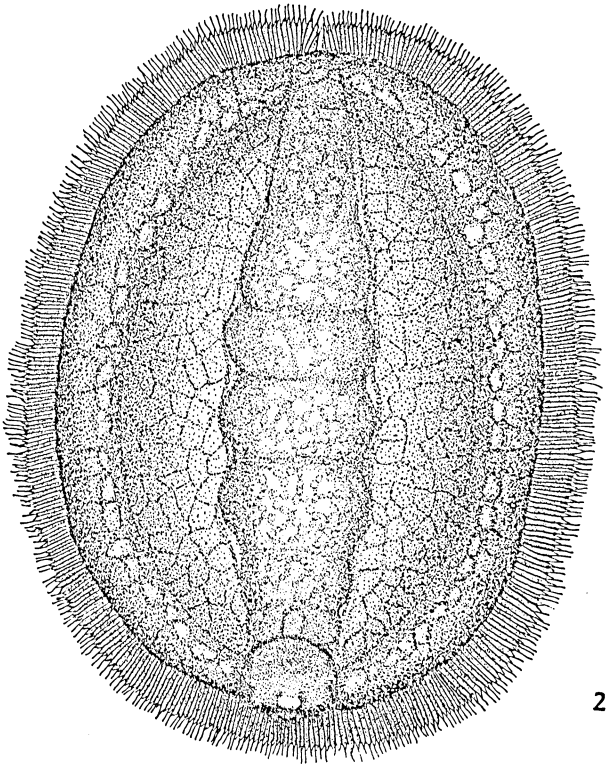


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Fig. 1. Wing of *Eristalis* (Comstock-Needham system). Fig. 2. Larva of *Microdon robusta* new species.

MICRODONTINAE

Microdon Meigen

The larvae of the members of this genus resemble certain molluscs and were first described as such; likewise, entomologists have mistaken them for coccids. Schlotthauber (1840) first recorded these larvae as syrphids belonging to the genus *Microdon* and cleared up the earlier erroneous concepts. Since then the developmental stages of several species have been described; some of the important investigators are Wheeler (1901, 1908), Donisthorpe (1909), Maria Andries (1912), Metcalf (1913b), Cole (1923), Greene (1923a), and Krüger (1926).

The larvae are usually found within the nests of ants. Wasmann (1894) recorded *Microdon* larvae from nests of termites, but thought there was a possibility that they were associated with ants living in the vicinity of the termite colony. Specimens of this genus were collected near St. Paul under the bark of a decomposing oak stump, in crevices of the wood, and in cerambycid galleries during the latter part of March 1936. They have often been reported from the nests of *Camponotus,* but in this case there was no evidence of ants near them.

There is some doubt concerning the nature of the ant-and-syrphid relationship. Little is known of the syrphids' feeding habits or why they should be found coincident with ants. Wheeler believes them to act as scavengers, feeding upon the minute pellets of food which are rejected from the hypopharyngeal pockets of the worker ants.

Key to Species

1. Posterior basitarsus greatly enlarged 2
   Posterior basitarsus normal 3
2. Third antennal segment shorter than first ..... *globosus*
   Third antennal segment longer than first ..... *pseudoglobosus*
3. Scutellum emarginate ..... *tristis*
   Scutellum evenly rounded 4
4. Abdomen slender, metallic, blackish green ..... *baliopterus*
   Abdomen robust, dark brown ..... *robusta*

Microdon baliopterus Loew

1872. *Microdon baliopterus* Loew, Berl. Ent. Zeit. 16:86.
1886. *Microdon baliopterus* Williston, Synop. N. A. Syrph., pp. 5-6.
1925. *Microdon baliopterus* Curran, Kan. Univ. Sci. Bul. 15:87-88.

Two males, one female, Luverne, September 13, 1935 (H. S. Telford); one male, Luverne, September 14, 1935 (H. S. Telford); one male, Luverne, September 14, 1935 (C. E. Mickel).

Microdon globosus (Fabricius)

1805. *Mulio globosus* Fabricius, Syst. Antl., p. 185.
1886. *Microdon globosus* Williston, Synop. N. A. Syrph., pp. 4-5.
1925. *Microdon globosus* Curran, Kan. Univ. Sci. Bul. 15:53-54.

One male, Hennepin County, June 30, 1888 (O. W. Oestland); one male, Hennepin County (O. W. Oestland); one male, Minneapolis, May 28, 1887 (O. W. Oestland).

Microdon pseudoglobosus Curran

1925. *Microdon pseudoglobosus* Curran, Kan. Univ. Sci. Bul. 15:57-58.

One male, Eagle Bend, July 25, 1921 (A. A. Nichol).

Microdon robusta new species (Plate I, figs. 5 and 6; Plate II, fig. 2)

LARVA: Oblong oval, flattened, rounded toward center; general color brown, dorsum reticulated; body divided into four distinct regions: outermost region or marginal fringe, submarginal ridge, interspace, and median ridge. Length 10 mm., width 6 mm.

Marginal fringe entire (except deep narrow incision on anterior portion of body), composed of numerous spinose processes inserted along border into columnar-like processes, latter granulated.

Submarginal ridge considerably raised, concentric, evenly rounded, entire except posterior portion where it is obscured by respiratory tubercle, outer region heavily granulated with an irregular reticulum, inner region more evenly reticulated forming a series of irregular triangles.

Interspace gradually raised inward toward median ridge, largest width subequal to submarginal ridge and marginal fringe combined, reticulum lighter forming regular three-, four-, or five-sided figures.

Median ridge with five prominent transverse elevations, greatest width slightly wider than interspace, much darker, reticulum irregular, heavily granulated, enclosed by line of granules anteriorly from marginal fringe to posterior respiratory tubercle; latter forms prominent knob at right angles to body, heavily granulated with two rounded processes superimposed upon each other on dorsal posterior portion, numerous papillae on either side ventrad to processes.

PUPARIUM: Shorter, more robust, subhemispherical, vestiture similar to larva, anterior cornua short, peg-like, almost as broad as long, bearing short papillae.

ADULT (FEMALE): General color brown, moderately white pilose, robust, scutellar spines present, posterior ocelli widely separated, length 8 mm.

Head hemispherical, white pilose except eyes, latter bare. Antennae elongate, dark brown, considerably longer than head; first segment four-fifths as long as the third, second short, one-fourth as long as first, arista bare, approximately one-half length of third segment. Face broad, sides subparallel with bronze metallic reflection, lower portion densely white pilose, shorter and sparser toward antennal bases. Antennal bases, small area above cheeks and oral margin, narrow longitudinal stripe in center of face, and small triangular area anterior to frontal groove bare, near its apex with pile directed outward. Diagonal rugose striations from posterior inner margin of eye to apex. Ocelli widely separated, posterior pair farther apart than to anterior ocellus.

Thorax concolorous with front; pile on dorsum white, relatively short; notum with weak rugose striations. Pleura bare except long white pile on upper anterior portion of propleura, posterior margin of mesopleura, and small area of upper portion of sternopleura. Scutellum evenly rounded, pile white, scutellar spines conical, prominent although sometimes obscured by pile; distance between them approximates length of fore basitarsus.

Abdomen almost as broad as long, dark brown, coarsely punctate. Second tergite with two distinct concavities on sublateral basal margins extending posteriorly; pile white, subappressed on disc, more upright on lateral margins. Third tergite bare, posterior margins pilose; small glabrous area in center extends into fourth tergite, extreme lateral margins slightly raised, lighter brown in color, with long white pile which extends along margin of fourth tergite. Latter twice as long as third, pile forming two acute triangles, their apices extending to posterior lateral margin, broadly separated in the middle. Fifth tergite with long white pile on margins, base with broad bare stripe, remainder short white pilose, except glabrous longitudinal stripe in center.

Legs brown, heavily clothed with short yellowish-white pile; fore legs light brown on trochanter, base of femur, extreme tip of femur and tibia; middle and posterior legs similar, latter with tibia more broadly light brown, particularly near the "pseudojoint."

Wings infuscated along all veins and posterior and proximal portions; M_{1+2} (apical crossvein) with no angulation.

Very similar to *tristis* Loew. Distinguished from it by the evenly rounded scutellum, rugose notum, and somewhat darker legs. The larvae of the two are also decidedly distinct.

HOLOTYPE: Female, Ramsey County, Battle Creek Park, Minnesota, April 25, 1936 (R. H. Daggy, A. B. Gurney, J. E. Ridley).

PARATYPES: One female, Ramsey County, Battle Creek Park, Minnesota, April 27, 1936 (R. H. Daggy, A. B. Gurney, J. E. Ridley); three larvae, same locality and collectors, April 17, 1936.

Types deposited in the University of Minnesota collection.

Microdon tristis Loew

1864. *Microdon tristis* Loew, Berl. Ent. Zeit. 8:73.
1886. *Microdon tristis* Williston, Synop. N. A. Syrph., p. 6.
1925. *Microdon tristis* Curran, Kan. Univ. Sci. Bul. 15:72-74.

Three females, four males; Hennepin, Hubbard, and St. Louis counties; May 28 to July 14.

SYRPHINAE

Key to Genera

1. Face and scutellum aeneous or black; abdominal margins subparallel; costa ending at or slightly beyond tip of wing 2
   Face and scutellum yellow; abdomen emarginate; costa usually ending before tip of wing 4
2. Wings shorter than abdomen, the latter depressed, long, elliptical; front and middle tarsi of males elaborately dilated ..... *Pyrophaena*
   Wings longer than abdomen 3
3. Front tibiae slender in both sexes ..... *Melanostoma*
   Front tibiae of male dilated; those of female less so ..... *Platycheirus*
4. Face less than one-third width of head; mesonotum without yellow markings; abdominal tergum without yellow cross bands 5
   Face wider than one-third width of head; abdomen and sometimes thorax with bright yellow markings 6
5. Eyes bare; abdomen petioled; elongate slender species ..... *Baccha*
   Eyes pilose; abdomen not petioled; small robust species ..... *Paragus*
6. Male genitalia long, projecting, somewhat cylindrical; abdomen of female broadly oval; fifth segment of the latter one-half as long as fourth ..... *Eupeodes*
   Male genitalia normal; fifth abdominal segment of female one-third or one-fourth as long as the preceding segment 7
7. Antennae very long, about six times as long as broad ..... *Chrysotoxum*
   Antennae less than three times as long as broad 8
8. Lateral margins of mesonotum with ground color yellow 11
   Lateral margins not yellow (although they may be slightly yellow pollinose) 9
9. Lower lobe of squamae pilose above; metasternum bare ..... *Syrphus*
   Lower lobe of squamae bare above 10
10. Abdomen distinctly emarginate ..... *Metasyrphus*
    Abdomen subparallel, the edges rolled under, often slender ..... *Epistrophe*
11. Posterior portion of oral margin black or gray; metapleura blackish aeneous 12
    Posterior portion of oral margin yellow; metapleura usually bright yellow 13
12. Hind femora of male thickened and arcuate; tibiae arcuate and dilated at tip; hind femora of female with black band ..... *Toxomerus*
    Hind femora and tibiae of male slender; hind femora of female yellow ..... *Mesogramma*

13. Eyes of male with an area of enlarged facets above; fourth abdominal tergite with two yellow stripes and oblique side spots ..... *Allograpta*
    Eyes of male normal; fourth abdominal tergite not so marked 14
14. Face projecting below; slender species, males with globular genitalia ..... *Sphaerophoria*
    Face receding; abdomen broadly oval ..... *Xanthogramma*

Pyrophaena Schiner

The biology of this group is little known. Lundbeck (1916) believed them to be entomophagous, similar to the very closely related genus *Platycheirus,* but gave no evidence for his belief. Sack (1929) recorded the larvae taken from stagnant water which had collected in stumps of trees in early spring. He described the larvae as very similar to *Platycheirus* and *Melanostoma.*

Key to Species

Abdominal tergum largely reddish yellow; front and middle tibiae of male flattened ..... *granditarsis*
Abdominal tergum largely black with anterior corners of third and fourth tergites reddish yellow ..... *rosarum*

Pyrophaena granditarsis (Forster)

1771. *Musca granditarsa* Forster, Nov. Sp. Ins., Cent. 1:99.
1886. *Pyrophaena ocymi* Williston, Synop. N. A. Syrph., pp. 55-56.
1931. *Pyrophaena granditarsis* Curran, Bul. Amer. Mus. Nat. Hist. 61:66-68.

Two females, three males; Sherburne, Cook, St. Louis, and Chisago counties; July 15 to August 22.

Pyrophaena rosarum (Fabricius)

1787. *Syrphus rosarum* Fabricius, Mantissa Ins. 2:341.
1886. *Pyrophaena rosarum* Williston, Synop. N. A. Syrph., p. 55.
1931. *Pyrophaena rosarum* Curran, Bul. Amer. Mus. Nat. Hist. 61: 66-68.

One female, St. Anthony Park; one female, Cook County, Cascade River near Lake Superior, August 11, 1929 (C. T. Schmidt).

Melanostoma Schiner

This genus is quite definitely a connecting link between the purely entomophagous forms and those feeding upon decomposing plant matter; however, the former type is more typical of the genus than the latter. Giard (1896) described the larva of *mellinum* (Linné) which had been observed feeding upon *Musca domestica* (Linné) and *Chortophila pusilla* (Meigen).

Chapman (1905) reared the larvae on the caterpillars of *Philedone hyerana* (Mill.). The various other reports are concerned primarily with their aphidophagous habits. Davidson (1922) made some interesting observations on the feeding habits of several of these species and described their life histories in detail.

Key to Species

Face on either side of tubercle obliquely striated.....*obscurum*
Face entirely smooth.....*pictipes*

Melanostoma obscurum (Say)

1824. *Syrphus obscurus* Say, Amer. Ent. 1:23.
1886. *Melanostoma obscurum* Williston, Synop. N. A. Syrph., p. 48.
1931. *Melanostoma obscurum* Curran, Bul. Amer. Mus. Nat. Hist. 61:64-68.

One female, Itasca Park, May 31, 1935 (John Hitchcock) on plum-cherry.

Melanostoma pictipes Bigot

1884. *Melanostoma pictipes* Bigot, Ann. Ent. Soc. Fr., ser. 6, 4:78-79.
1886. *Melanostoma pictipes* Williston, Synop. N. A. Syrph., pp. 52-53.
1931. *Melanostoma pictipes* Curran, Bul. Amer. Mus. Nat. Hist. 61: 64-68.

Numerous specimens; Ramsey, Aitkin, Cook, Clearwater, Hennepin, Benson, Olmsted, Norman, Chisago, Mille Lacs, Trail, Pine, Anoka, and Ottertail counties; May 11 to September 13.

Platycheirus St. Fargeau and Serville

The larvae of this genus closely resemble those of *Melanostoma* in both habits and structures, and like *Melanostoma* are transitional forms. They have been found in nature feeding upon aphids and decomposing plant material. Van Roser (1834) reported *scutatus* (Meigen) reared on rotten fungi. Metcalf (1917) successfully reared the same species upon aphids. Krüger (1926) discovered *scutatus* (Meigen) while fishing through a pool with a plankton net and later found them among aphids. This species at least has a rather wide range of feeding habits. Other reports, Metcalf (1917) and Fluke (1929), indicate that they are normally aphidophagous and are invaluable natural checks upon plant lice. Heiss (1938) described the larva and puparium of *quadratus* (Say).

Key to Species

(Males only)

1. Front tibiae abruptly dilated at the extreme tip ..... *peltatus*
   Front tibiae gradually dilated from base to tip 2
2. Middle femora with dense basal patch of blackish-brown pile ..... *quadratus*
   Middle femora without such pile 3
3. Abdominal tergum almost entirely yellowish orange, if black is present, restricted to obscure cross bands on the apices of the tergites; front femora without isolated black pile ..... *modestus*
   Abdominal tergum with median black stripe and transverse bands, if narrowed or obsolete, the anterior femora with isolated black pile 4
4. Anterior femora with one or two angularly curved white hairs at base 5
   Anterior femora without such hairs ..... *scambus*
5. Anterior femora with five or six isolated black hairs on the ventro-anterior edge; black longitudinal and cross bands of abdominal tergum narrow, the former sometimes obsolete ..... *immarginatus*
   Anterior femora without such hairs; black longitudinal and cross bands broad, never obsolete; second abdominal tergite with small isolated yellowish-orange spots 6
6. Yellow spots on second abdominal tergite round, widely separated, situated on posterior half; yellow markings on third and fourth abdominal tergites broad, their inner posterior margins evenly rounded ..... *erraticus*
   Yellow spots on second abdominal tergite larger, triangular; yellow markings on third and fourth tergites distinctly rectangular ..... *angustatus*

Platycheirus angustatus (Zetterstedt)

1843. *Scaeva angustata* Zetterstedt, Dipt. Scand. 2:762-763.
1927. *Platycheirus angustatus* Curran, Amer. Mus. Nov. 247:1-4.
1931. *Platycheirus angustatus* Curran, Bul. Amer. Mus. Nat. Hist. 61:66-68.

One male, Two Harbors, July 3, 1927 (M. H. Hatch).

Platycheirus erraticus Curran

1927. *Platycheirus erraticus* Curran, Amer. Mus. Nov. 247:7.
1931. *Platycheirus erraticus* Curran, Bul. Amer. Mus. Nat. Hist. 61: 66-68.

Numerous specimens; Ramsey, Clearwater, Houston, Chisago, Koochiching, Anoka, Pine, Hennepin, Olmsted, Lake, Steele, Norman, Beltrami, Cass, and Washington counties; May 27 to August 11.

Platycheirus immarginatus (Zetterstedt)

1848. *Scaeva immarginata* Zetterstedt, Dipt. Scand. 8:3149.
1927. *Platycheirus immarginatus* Curran, Amer. Mus. Nov. 247:1-4.
1931. *Platycheirus immarginatus* Curran, Bul. Amer. Mus. Nat. Hist. 61:66-68.

Eleven males; Lake, Hennepin, Cook, Anoka, Pine, Norman, Olmsted, and Ramsey counties; July 2 to August 13.

Platycheirus modestus Ide

1926. *Platycheirus modestus* Ide, Can. Ent. 58:155-156.
1927. *Platycheirus modestus* Curran, Amer. Mus. Nov. 247:1-4.

One male, Kinmouth, June 8, 1934 (D. G. Denning).

Platycheirus peltatus (Meigen)

1822. *Syrphus peltatus* Meigen, Syst. Beschr. 3:334-335.
1886. *Platychirus peltatus* Williston, Synop. N. A. Syrph., pp. 58-59.
1927. *Platycheirus peltatus* Curran, Amer. Mus. Nov. 247:1-4.
1931. *Platycheirus peltatus* Curran, Bul. Amer. Mus. Nat. Hist. 61: 66-68.

One male, Hennepin County, May 21, 1925 (C. B. Philip).

Platycheirus quadratus (Say)

1823. *Scaeva quadrata* Say, Jour. Acad. Nat. Sci. Phil. 3:90.
1886. *Platychirus quadratus* Williston, Synop. N. A. Syrph., p. 57.
1927. *Platycheirus quadratus* Curran, Amer. Mus. Nov. 247:1-4.
1931. *Platycheirus quadratus* Curran, Bul. Amer. Mus. Nat. Hist. 61:66-68.

Numerous specimens; Carver, Wabasha, Wadena, Anoka, Le Sueur, Washington, Ramsey, Hennepin, Lake, Carlton, Goodhue, Aitkin, Norman, Ottertail, Cook, Pine, Olmsted, and Chisago counties; May 20 to September 13.

Platycheirus scambus Staeger

1843. *Platychirus scambus* Staeger, Natur. Tid. 4:325-326.
1927. *Platycheirus scambus* Curran, Amer. Mus. Nov. 247:1-4.
1931. *Platycheirus scambus* Curran, Bul. Amer. Mus. Nat. Hist. 61: 66-68.

One male, Lake County, Stewart River near Lake Superior, August 12, 1929 (C. T. Schmidt); one male, Hennepin County (O. W. Oestlund).

Baccha Fabricius

This genus is particularly noted for its predaceous habits not only upon aphids but upon certain coccids as well. Probably the first record of their habits was the work of Guérin-Méneville (1848) in which he described the stages of *cochenillivora* Guér.-Mén. and reported it feeding upon cochineal. Osten Sacken (1862) summarized the data concerning *Baccha* larvae and observed a species from southern United States feeding on a species of *Coccus* infesting orange trees. Hubbard (1885) described the stages of three species of this genus all of which were feeding upon aphids. Davidson (1917) and Curran (1925d) recorded them feeding upon mealy bugs. Bhatia and Schaffi (1932) observed *pulchifrons* Aust. feeding upon the eggs of *Chrysopa*. Heiss (1938) described the life history and food habits of *clavata* (Fabr.) and the puparium of *lugens* Loew.

Baccha fascipennis Wiedemann (Plate I, fig. 4)

1830. *Baccha fascipennis* Wiedemann, Auss. Zweifl. Ins. 2:96.
1886. *Baccha aurinota* Williston, Synop. N. A. Syrph., pp. 120-121.
1930. *Baccha fascipennis* Curran, Amer. Mus. Nov. 403:1-4.

Four females, one male; Wabasha, Houston, Norman, Olmsted, and St. Louis counties; May 23 to September 30.

Paragus Latreille

The two species represented from the state, *bicolor* (Fabr.) and *tibialis* (Fallén), are very common and have long been known to be aphidophagous. Rondani (1847) found the larvae among aphids and described the stage of each species. Other observations on members of this genus have confirmed this aphidophagous habit. Their life histories have been treated by Metcalf (1911b), Jones (1922), and Heiss (1938).

Key to Species

Scutellum with yellow border; face of male without median black stripe; front of female narrow above ..... *bicolor*
Scutellum without yellow border; face in both sexes with median black stripe; front of female of nearly equal width ..... *tibialis*

Paragus bicolor (Fabricius)

1794. *Syrphus bicolor* Fabricius, Ent. Syst. 4:297-298.
1886. *Paragus bicolor* Williston, Synop. N. A. Syrph., pp. 18-19.

Numerous specimens; Ramsey, Anoka, Olmsted, Hennepin, Sherburne, Traverse, Washington, Chisago, and Lake counties; June 3 to September 2.

Paragus tibialis (Fallén)

1817. *Pipiza tibialis* Fallén, Syrph. Suec. 60:5.
1886. *Paragus tibialis* Williston, Synop. N. A. Syrph., pp. 19-20.

Numerous specimens; Scott, Ramsey, Lyon, Olmsted, Traverse, Hennepin, St. Louis, Anoka, and Pope counties; June 19 to September 5.

Eupeodes Osten Sacken

The larvae are typically aphidophagous. Jones (1922) described the larval stage of *volucris* Osten Sacken, and reported it as one of the more important economic forms in Colorado. Mr. D. J. Pletsch collected puparia of this species in Minnesota a few inches below sod finding them quite numerous; sixteen were taken from one-quarter of a square meter. They were heavily parasitized by *Pachyneuron allograptae* Ashmead. Heiss (1938) described the life history of *volucris* Osten Sacken from specimens taken in Colorado.

Eupeodes volucris Osten Sacken

1877. *Eupeodes volucris* Osten Sacken, West. Dipt., pp. 329-330.
1886. *Eupeodes volucris* Williston, Synop. N. A. Syrph., p. 65.

Two females, three males, Ramsey County; May 6 to September 13.

Syrphus Fabricius, *Metasyrphus* Matsumura and Adachi, and *Epistrophe* Walker

These genera are all closely related and deviate but little from each other in their biological relationships. They are the most typical of the aphidophagous forms and are probably one of the best known groups, both biologically and taxonomically. The species included in these genera probably constitute the most important ones in the control of plant lice. Réaumur, Linné, DeGeer, Fallén and other early workers were acquainted with the habits of the larvae and since then many biological data have been accumulated, most of which deal with the nearctic species. The more important references are: Metcalf (1911, 1912, 1913, 1916, 1917), Jones (1922), Krüger (1926), Fluke (1929), Bhatia and Schaffi (1932), and Heiss (1938).

Metasyrphus wiedemanni (John.) is by far the most abundant species belonging to this general group occurring in Minnesota. The writer found them particularly abundant in the middle of June in 1935 feeding upon *Aphis rhamni* Fons.

Syrphus Fabricius

Key to Species

1. Eyes pilose ..... *torvus*
   Eyes bare 2
2. First segment of middle tarsi with yellow spicules beneath; sides of mesonotum distinctly yellow pollinose ..... *knabi*
   First segment of middle tarsi with black spicules beneath 3
3. Antennae mostly reddish, third segment brown on dorsum; femora of female yellow ..... *bigelowi*
   Antennae brown or black 4
4. Face with median brown or black stripe ..... *ribesii vittafrons*
   Face entirely yellow 5
5. Eyes dichoptic (females) 6
   Eyes holoptic (males) 8
6. Second abdominal band of same width throughout or slightly narrowed near margin; posterior femora with broad preapical band ..... *rectus*
   Second abdominal band distinctly narrowed near margin 7
7. Bases of femora black ..... *vitripennis*
   Femora yellow ..... *ribesii*
8. Second abdominal band narrowed to one-fourth its width near margin 9
9. Bases of femora black ..... *vitripennis*
   Femora yellow ..... *ribesii*

Syrphus bigelowi Curran

1924. *Syrphus bigelowi* Curran, Can. Ent. 56:288.
1931. *Syrphus bigelowi* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Syrphus bigelowi* Fluke, Trans. Wis. Acad. Sci. 28:71.

Four females, three males, Cook, St. Louis, Todd, Hennepin, and Hubbard counties; May 28 to August 17.

Syrphus knabi Shannon

1916. *Syrphus knabi* Shannon, Proc. Biol. Soc. Wash. 29:200.
1921. *Syrphus knabi* Curran, Can. Ent. 53:154.
1931. *Syrphus knabi* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Syrphus knabi* Fluke, Trans. Wis. Acad. Sci. 28:76-77.

One female, Olmsted County, July 1904 (C. N. Ainslie); one female, Washington County, July 8, 1910; one female, Lake City, July 5, 1927 (C. E. Mickel).

Syrphus rectus Osten Sacken

1875. *Syrphus rectus* Osten Sacken, Proc. Bost. Soc. Nat. Hist. 18: 140-143.
1886. *Syrphus ribesii* Williston, Synop. N. A. Syrph., pp. 77-79.
1921. *Syrphus rectus* Curran, Can. Ent. 53:155.

1931. *Syrphus rectus* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Syrphus rectus* Fluke, Trans. Wis. Acad. Sci. 28:70-71.

Numerous specimens; Ramsey, St. Louis, Wabasha, Pope, Olmsted, Hennepin, Cook, and Roseau counties; May 10 to September 1.

Syrphus ribesii (Linné)

1758. *Musca ribesii* Linné, Syst. Nat., 10th ed., pp. 593-594.
1886. *Syrphus ribesii* Williston, Synop. N. A. Syrph., pp. 77-79.
1921. *Syrphus ribesii* Curran, Can. Ent. 53:154.
1931. *Syrphus ribesii* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1935. *Syrphus ribesii* Fluke, Trans. Wis. Acad. Sci. 28:67-69.

Five females; Kanabec, Hubbard, St. Louis, and Crow Wing counties, June 25 to August 27.

Syrphus ribesii vittafrons Shannon

1916. *Syrphus ribesii vittafrons* Shannon, Proc. Biol. Soc. Wash. 29:202.
1921. *Syrphus ribesii vittafrons* Curran, Can. Ent. 53:154.
1931. *Syrphus ribesii vittafrons* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Syrphus ribesii vittafrons* Fluke, Trans. Wis. Acad. Sci. 28:69.

Eight females, five males; Hennepin, Le Sueur, Houston, Norman, Hubbard, Ramsey, Olmsted, and St. Louis counties; May 19 to August 27.

Syrphus torvus Osten Sacken

1875. *Syrphus torvus* Osten Sacken, Proc. Bost. Soc. Nat. Hist. 18: 139-140.
1886. *Syrphus torvus* Williston, Synop. N. A. Syrph., pp. 79-80.
1921, *Syrphus torvus* Curran, Can. Ent. 53:152.
1931. *Syrphus torvus* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Syrphus torvus* Fluke, Trans. Wis. Acad. Sci. 28:71.

Five females, four males; Hubbard, Hennepin, Ramsey, Olmsted, and Kittson counties; April to August 20.

Syrphus vitripennis Meigen

1822. *Syrphus vitripennis* Meigen, Syst. Besch. 3:308.
1921. *Syrphus vitripennis* Curran, Can. Ent. 53:156.
1931. *Syrphus vitripennis* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Syrphus vitripennis* Fluke, Trans. Wis. Acad. Sci. 28:70.

One female, Grand Rapids, July 7, 1935 (C. E. Mickel, H. S. Telford) on *Angelica*.

Metasyrphus Matsumura and Adachi

Key to Species

1. Face with median black or dark brown stripe 5
   Face entirely yellow 2
2. Posterior margin of third abdominal tergite with transverse yellow band ..... *emarginatus*
   Posterior margin of third abdominal tergite entirely black 3
3. Yellow abdominal bands interrupted 4
   Yellow abdominal bands entire beyond second abdominal tergite ..... *latifasciatus*
4. Bases of femora black; face between eyes and oral opening large ..... *divisus*
   Front legs entirely yellow; face yellow; anterior corners of fourth abdominal tergite yellow ..... *weborgi*
5. Yellow bands on third and fourth tergites entire 6
   Yellow bands on third and fourth tergites interrupted 8
6. Yellow cross bands on third and fourth abdominal tergites reach the margin ..... *medius*
   Yellow cross bands on third and fourth abdominal tergites do not reach the margin 7
7. Pile on scutellum yellow ..... *wiedemanni*
   Pile on scutellum white ..... *canadensis*
8. Metasternum pilose 9
   Metasternum bare 10
9. Thoracic pile white ..... *perplexus*
   Thoracic pile yellow ..... *neoperplexus*
10. Second and third pairs of yellow spots on abdominal tergum greatly excised ..... *amalopis*
    Second and third pairs of yellow spots lunulate 11
11. R_{1+5} vein curved into cell R_5 ..... *lapponicus*
    R_{1+5} vein straight ..... *laticaudus*

Metasyrphus amalopis (Osten Sacken)

1875. *Syrphus amalopis* Osten Sacken, Proc. Bost. Soc. Nat. Hist. 18:148-149.
1877. *Syrphus intrudens* Osten Sacken, Western Dipt., p. 326.
1886. *Syrphus amalopis* Williston, Synop. N. A. Syrph., pp. 69-70.
1931. *Syrphus amalopis* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Metasyrphus amalopis* Fluke, Trans. Wis. Acad. Sci. 28:110-111.

One female, Basswood Lake, June 1904.

Metasyrphus canadensis (Curran)

1926. *Syrphus canadensis* Curran, Can. Ent. 58:172-173.
1933. *Metasyrphus canadensis* Fluke, Trans. Wis. Acad. Sci. 28:86-87.

One female, St. Paul, University Farm, May 20, 1921 (P. L. Keene), fly trap.

Metasyrphus divisus (Williston)

1882. *Xanthogramma divisa* Williston, Proc. Amer. Phil. Soc. 20:311.
1886. *Syrphus disjectus* Williston, Synop. N. A. Syrph., p. 73.
1931. *Syrphus divisus* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1931. *Syrphus divisus* Fluke, Trans. Wis. Acad. Sci. 26:301.
1933. *Metasyrphus divisus* Fluke, Trans. Wis. Acad. Sci. 28:83.

Two males, Itasca Park, July 20, 1914 (S. A. Graham); four males, two females, Grand Rapids, July 7, 1935 (C. E. Mickel, H. S. Telford) on *Angelica.*

Metasyrphus emarginatus (Say)

1823. *Scaeva emarginata* Say, Jour. Acad. Nat. Sci. Phil. 3:91-92.
1886. *Xanthogramma emarginata* Williston, Synop. N. A. Syrph., pp. 93-94.
1931. *Syrphus emarginatus* Curran, Bul. Amer. Mus. Nat. Hist. 61: 56.
1931. *Syrphus emarginatus* Fluke, Trans. Wis. Acad. Sci. 26:290-294.
1933. *Metasyrphus emarginatus* Fluke, Trans. Wis. Acad. Sci. 28:84.

One female, Cass County, July 1898 (O. W. Oestlund).

Metasyrphus lapponicus (Zetterstedt)

1817. *Scaeva arcuata* Fallén, Syrph. Suec. 20:42.
1838. *Scaeva lapponica* Zetterstedt, Insecta Lap., p. 598.
1886. *Syrphus arcuatus* Williston, Synop. N. A. Syrph., pp. 68-69.
1925. *Syrphus lapponicus* Curran, Kan. Univ. Sci. Bul. 15:175.
1931. *Syrphus lapponicus* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Metasyrphus lapponicus* Fluke, Trans. Wis. Acad. Sci. 28: 104-106.

Six females, five males; Hubbard, Hennepin, Roseau, and St. Louis counties; May 20 to July 4.

Metasyrphus laticaudus (Curran)

1925. *Syrphus laticaudus* Curran, Kan. Univ. Sci. Bul. 15:175-176.
1931. *Syrphus laticaudus* Curran, Bul. Amer. Mus. Nat. Hist. 61:57.
1933. *Metasyrphus laticaudus* Fluke, Trans. Wis. Acad. Sci. 28:117-118.

One male, Cass Lake, May 16, 1936 (R. H. Daggy).

This specimen differs from Fluke's description by having the scutellum and notum with black pile.

Metasyrphus latifasciatus (Macquart)

1829. *Syrphus latifasciatus* Macquart, Ins. Dipt. du Nord de la France 4:242.

1931. *Syrphus latifasciatus* Curran, Bul. Amer. Mus. Nat. Hist. 61: 56.
1933. *Metasyrphus latifasciatus* Fluke, Trans. Wis. Acad. Sci. 28: 92-93.

One female, Ramsey County, September 21, 1933 (E. C. Murdock).

Metasyrphus medius (Jones)

1917. *Syrphus medius* Jones, Ann. Ent. Soc. Amer. 10:224.
1931. *Syrphus medius* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Metasyrphus medius* Fluke, Trans. Wis. Acad. Sci. 28:89.

One female, St. Peter Fish Hatchery, July 20, 1922 (Wm. E. Hoffmann); one female, Ft. Snelling, August 1, 1925 (R. W. Dawson), high prairie; one female, Lake City, July 11, 1927 (C. E. Mickel).

Metasyrphus neoperplexus (Curran)

1925. *Syrphus neoperplexus* Curran, Kan. Univ. Sci. Bul. 15:93-94.
1931. *Syrphus neoperplexus* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Metasyrphus neoperplexus* Fluke, Trans. Wis. Acad. Sci. 28: 101-102.

One male, Itasca Park, July 3, 1928 (L. W. Orr).

Metasyrphus perplexus (Osburn)

1910. *Syrphus perplexus* Osborn, Jour. N. Y. Ent. Soc. 18:55-57.
1931. *Syrphus perplexus* Curran, Bul. Amer. Mus. Nat. Hist. 61:56.
1933. *Metasyrphus perplexus* Fluke, Trans. Wis. Acad. Sci. 28:99-101.

Three females, one male; Hubbard, Lake, and Cook counties; May 30 to August 20.

Metasyrphus weborgi (Fluke)

1931. *Syrphus weborgi* Fluke, Trans. Wis. Acad. Sci. 26:299-301.
1933. *Metasyrphus weborgi* Fluke, Trans. Wis. Acad. Sci. 28:83.

One male, Grand Rapids, July 7, 1935 (C. E. Mickel, H. S. Telford) on *Angelica.*

Metasyrphus wiedemanni (Johnson)

1830. *Syrphus americanus* Wiedemann, Auss. Zweifl. Ins. 2:129-130.
1886. *Syrphus americanus* Williston, Synop. N. A. Syrph., pp. 82-83.
1919. *Syrphus wiedemanni* Johnson, Can. Ent. 51:32.

1931. *Syrphus wiedemanni* Curran, Bul. Amer. Mus. Nat. Hist. 61: 56.
1933. *Metasyrphus wiedemanni* Fluke, Trans. Wis. Acad. Sci. 28: 84-85.

Numerous specimens; Big Stone, Cook, Chisago, Lake, Clearwater, Martin, Wabasha, Norman, Yellow Medicine, Hennepin, Marshall, McLeod, Ramsey, Hubbard, Olmsted, Freeborn, Beltrami, Wadena, Pope, Houston, Washington, Winona, Ottertail, Renville, Le Sueur, and Nicollet counties; from May 27 to September 20.

Epistrophe Walker

Key to Species

1. Metasternum pilose 2
   Metasternum bare 3
2. Abdominal cross bands yellow or reddish ..... *grossulariae*
   Abdominal cross bands metallic ..... *grossulariae melanis*
3. Antennae orange, arista brown ..... *xanthostomus*
   Antennae in part or entirely black or brown 4
4. Yellow cross bands on third and fourth abdominal tergites separated 5
   Yellow cross bands on third and fourth abdominal tergites entire ..... *cinctellus*
5. First pair of abdominal spots widely separated ..... *albipunctatus*
   First pair of abdominal spots separated by narrow line ..... *fisherii*

Epistrophe albipunctatus (Curran)

1925. *Stenosyrphus albipunctatus* Curran, Kan. Univ. Sci. Bul. 15: 104-106.
1935. *Epistrophe albipunctatus* Fluke, Ent. Amer. 15:45-46.

Two females, Grand Rapids, July 7, 1935 (C. E. Mickel, H. S. Telford) on *Angelica.*

Epistrophe cinctellus (Zetterstedt)

1848. *Scaeva cinctella* Zetterstedt, Dipt. Scand. 2:742.
1886. *Syrphus diversipes* Williston, Synop. N. A. Syrph., p. 76.
1925. *Stenosyrphus cinctellus* Curran, Kan. Univ. Sci. Bul. 15:97.
1935. *Epistrophe cinctellus* Fluke, Ent. Amer. 15:13-14.

One female, Itasca Park, June 19, 1914 (S. A. Graham).

Epistrophe fisherii (Walton)

1911. *Syrphus fisherii* Walton, Ent. News 22:319.
1925. *Stenosyrphus fisherii* Curran, Kan. Univ. Sci. Bul. 15:95-98.
1935. *Epistrophe fisherii* Fluke, Ent. Amer. 15:44.

One female, Luverne, September 10, 1913.

Epistrophe grossulariae (Meigen)

1822. *Syrphus grossulariae* Meigen, Syst. Besch. 3:306.
1886. *Syrphus lesueurii* Williston, Synop. N. A. Syrph., pp. 80-81.
1925. *Stenosyrphus grossulariae* Curran, Kan. Univ. Sci. Bul. 15: 95-98.
1935. *Epistrophe grossulariae* Fluke, Ent. Amer. 15:8-9.

Three females, five males; Cook, Hubbard, Lake, St. Louis, Ramsey, and Roseau counties; July 16 to August 27.

Epistrophe grossulariae melanis (Curran)

1922. *Stenosyrphus grossulariae melanis* Curran, Can. Ent. 54:96.
1925. *Stenosyrphus grossulariae melanis* Curran, Kan. Univ. Sci. Bul. 15:95-98.
1935. *Epistrophe grossulariae melanis* Fluke, Ent. Amer. 15:8-9.

One female, Itasca Park, August 21, 1928 (L. W. Orr); one female, Koochiching County, August 14, 1910.

Epistrophe xanthostomus (Williston)

1886. *Syrphus xanthostomus* Williston, Synop. N. A. Syrph., p. 86.
1925. *Stenosyrphus xanthostomus* Curran, Kan. Univ. Sci. Bul. 15: 95-98.
1935. *Epistrophe xanthostomus* Fluke, Ent. Amer. 15:9.

One female, Minneapolis, May 28, 1930 (Dwight Buchanan).

Mesogramma Loew

Mesogramma polita (Say) has been incriminated as a corn pest by Riley and Howard (1888). Folsom (1909) observed it feeding upon the clover louse. Curran (1925d) considered it noninjurious to corn and thought it fed primarily upon pollen. Heiss (1938) described the larva and puparium.

Mesogramma marginata (Say) is the most common species of the entire family in Minnesota and it is truly remarkable that so little is known of its normal feeding habits. Folsom (1909) and Smith (1923) observed the larva feeding upon the clover aphid. Fluke was successful in rearing the larvae to maturity and described the immature stages.

Key to Species

Front of female slightly narrowed toward vertex; third to fifth abdominal tergites with narrow lateral yellow margins ..... *marginata*
Front of female considerably narrowed toward vertex; third to fifth abdominal tergites with alternating yellow and black margins ..... *polita*

Mesogramma marginata (Say)

1823. *Scaeva marginata* Say, Jour. Acad. Nat. Sci. Phil. 3:92.
1886. *Mesograpta marginata* Williston, Synop. N. A. Syrph., pp. 100-101.
1930. *Mesogramma marginata* Curran, Amer. Mus. Nov. 405:2.

Numerous specimens; Big Stone, Clearwater, Olmsted, Hennepin, Ramsey, Yellow Medicine, Beltrami, St. Louis, Washington, Winona, Chisago, Wabasha, Fillmore, Carter, Scott, Sherburne, Cook, Lake, Steele, Hubbard, Norman, Anoka, Le Sueur, Houston, Pine, Isanti, Mille Lacs, Traverse, Todd, Rice, Sibley, Rock, Martin, Pine, Koochiching, Wadena, Red Lake, Benton, Swift, Roseau, Polk, Nicollet, Crow Wing, and Kandiyohi counties; June 6 to September 19.

Mesogramma polita (Say)

1823. *Scaeva polita* Say, Jour. Acad. Nat. Sci. Phil. 3:88.
1886. *Mesograpta polita* Williston, Synop. N. A. Syrph., p. 98.
1930. *Mesogramma polita* Curran, Amer. Mus. Nov. 405:2.

One male, one female, St. Anthony Park, November 10, 1900; two females, Glenville, August 5, 1921 (P. L. Keene).

Toxomerus Macquart

The larvae are thought to be aphidophagous. Two larval specimens were collected by Fluke (1929) from alfalfa heavily infested with the pea aphid, but no detailed life-history studies have been made. Heiss (1938) described the puparium of *geminata* (Say).

Toxomerus geminata (Say)

1823. *Scaeva geminata* Say, Jour. Acad. Nat. Sci. Phil. 3:92-94.
1886. *Mesograpta geminata* Williston, Synop. N. A. Syrph., p. 102.

Numerous specimens; Ramsey, Pine, Red Lake, Norman, Chisago, Lake, Polk, Wadena, Big Stone, St. Louis, Beltrami, Clearwater, Olmsted, and Kandiyohi counties; May 27 to September 24.

Xanthogramma Schiner

Until comparatively recent times, the biology of the members of this genus was little known. Beling (1882) found the immature stages of *ornatum* Meigen under turf. Lundbeck (1916) called attention to Brauer's suggestions that they may live in ants' nests. Owing to the fact that the adults resemble very closely the aphidophagous forms, subsequent investigators believed them to be aphidophagous. No actual evidence was pre-

sented on their biology until the work of Hölldobler (1929). He discovered the larvae of *citrofasciatum* (DeGeer) within the nests of *Lasius,* successfully reared them to maturity in an artificial ants' nest, and described their stages. The larvae resemble ant larvae and are apparently nurtured for a part of their existence by the workers. They refused live aphids when offered to them, which gives added evidence that they are probably not aphidophagous. Heiss (1938) described the larva and puparium of *flavipes* (Loew).

Xanthogramma flavipes (Loew)

1863. *Doros flavipes* Loew, Berl. Ent. Zeit. 7:318.
1886. *Xanthogramma flavipes* Williston, Synop. N. A. Syrph., pp. 94-95.

Four females, one male; Hennepin, Norman, and St. Louis counties; May 25 to July 7.

Sphaerophoria St. Fargeau and Serville

The larvae are aphidophagous. Rösel (1749) described the larvae and puparia of *scripta* (Linné) which were found among aphids. Their life histories have subsequently been described by Metcalf (1912b, 1916) and Heiss (1938). Davidson (1917) reported *sulphuripes* Thompson as an enemy of the bean thrips, *Heliothrips fasciatus* Perg.

Key to Species

Yellow lateral thoracic stripes entire ..... *robusta*
Yellow lateral thoracic stripes interrupted at wing base ..... *cylindrica*

Sphaerophoria cylindrica (Say)

1824. *Syrphus cylindrica* Say, Amer. Ent. 1:22-23.
1886. *Sphaerophoria cylindrica* Williston, Synop. N. A. Syrph., p. 105.
1931. *Sphaerophoria cylindrica* Curran, Bul. Amer. Mus. Nat. Hist. 61:61.

Numerous specimens; Ramsey, Hennepin, Chisago, Wabasha, Le Sueur, Anoka, Hubbard, Sherburne, Olmsted, Norman, Steele, Houston, Pine, Washington, Marshall, Faribault, Beltrami, Big Stone, Rock, Clearwater, St. Louis, Benton, Roseau, Wadena, and Polk counties; May 20 to August 27.

Sphaerophoria robusta Curran

1931. *Sphaerophoria robusta* Curran, Bul. Amer. Mus. Nat. Hist. 61:62-63.

Numerous specimens; Ramsey, Wadena, Chisago, Pine, Hennepin, Aitkin, Roseau, Red Lake, Benton, Carver, Clearwater, Cook, Cass, Todd, Norman, Lake, Koochiching, Pope, Lincoln, Anoka, Steele, Olmsted, Scott, Houston, Faribault, Polk, and Washington counties; June 9 to September 1.

Allograpta Osten Sacken

As far as is known, all are typically aphidophagous. The only species recorded for the state is *obliqua* (Say) which is common. Its life history is well known, having been described by Metcalf (1912b, 1913b, 1916), Jones (1922), Campbell and Davidson (1924), and Heiss (1938).

Allograpta obliqua (Say)

1823. *Scaeva obliqua* Say, Jour. Acad. Nat. Sci. Phil. 3:89-90.
1886. *Allograpta obliqua* Williston, Synop. N. A. Syrph., pp. 96-97.
1932. *Allograpta obliqua* Curran, Amer. Mus. Nov. 519:2.

Numerous specimens; Hennepin, Ramsey, Norman, Chisago, St. Louis, Big Stone, Wabasha, Faribault, Lyon, Steele, Nicollet, Cook, and Olmsted counties; June 9 to September 1.

Chrysotoxum Meigen

The members of this genus deviate considerably from the typical Syrphinae in both larval and adult structures and habits. Their life histories are very little known. Van Roser (1834) recorded the larva of *festivum* (Linné) in a hollow tree. Beling (1882) described the larva of *bicinctum* (Linné) which was found in a compost heap. Greene (1923b) described the larva and puparium of *pubescens* Loew which were found under a stone in a relatively damp environment.

Key to Species

1. Pile of pteropleura black; sternopleura entirely black ..... *fasciolatum*
   Pile of pteropleura yellow; small gray spot on sternopleura 2
2. Two pairs of large yellow spots on third and fourth sternites, over half the length of the segment ..... *pubescens*
   Spots on third and fourth sternites small, inconspicuous, sometimes absent ..... *minor*

Chrysotoxum fasciolatum (DeGeer)

1776. *Musca fasciolatus* DeGeer, Mem. Serv. Hist. Ins. 6:124-125.
1924. *Chrysotoxum fasciolatum* Johnson, Occ. Papers Bost. Soc. Nat. Hist. 5:97-100.

1924. *Chrysotoxum fasciolatum* Curran, Can. Ent. 56:40.
1926. *Chrysotoxum fasciolatum* Shannon, Proc. U. S. Nat. Mus. 69: 10.

One female, Cook County, July 25, 1928 (L. W. Orr); one male, Basswood Lake, June 1904, on woodchuck excrement; one female, Itasca Park, June 19, 1936 (C. E. Mickel); one female, Lake County, July 4, 1938 (Herbert Knutson).

Chrysotoxum minor Curran

1927. *Chrysotoxum minor* Curran, Can. Ent. 59:206.

One male, one female, Warroad, July 16, 1925 (C. B. Philip); one female, Middle River, July 24, 1935 (D. G. Denning).

Chrysotoxum pubescens Loew

1860. *Chrysotoxum pubescens* Loew, Wien. Ent. Monatsch. 4:84.
1886. *Chrysotoxum pubescens* Williston, Synop. N. A. Syrph., p. 15.
1924. *Chrysotoxum pubescens* Curran, Can. Ent. 56:40.
1926. *Chrysotoxum pubescens* Shannon, Proc. U. S. Nat. Mus. 69: 11-12.

One male, Crookston, June 29, 1936 (D. G. Denning).

CHEILOSINAE

Key to Genera

1. Face with distinct tubercle, between base of antenna and epistoma 2
   Face without tubercle, epistoma sometimes projecting 4
2. r-m crossvein at or beyond middle of cell M_2, mesonotum with strong bristles, general color brassy ..... *Ferdinandea*
   r-m crossvein before middle of cell M_2 3
3. Eyes pilose; antennal pits separated ..... *Cheilosia*
   Eyes bare; antennal pits confluent ..... *Cartosyrphus*
4. Front and face rugose 5
   Front and face smooth 6
5. Antennae elongate ..... *Orthoneura*
   Antennae normal ..... *Chrysogaster*
6. Eyes pilose 7
   Eyes bare 9
7. Middle tibiae slender, not convex anteriorly from dorsal view 8
   Middle tibiae of male conspicuously broadened; female slightly broadened and slightly convex anteriorly from the dorsal view; middle coxae of male with a slender process near their inner end ..... *Cnemodon*
8. Fourth sternite of male as long as its tergite; third antennal joint of female elliptical ..... *Heryngia*
   Fourth sternite of male three-fourths as long as its tergite; antennae of female more than twice as long as broad; eyes with an indistinct transverse, less thickly pilose stripe ..... *Pipizella*

9. Epistoma produced into a long porrect snout ..... *Rhingia*
   Epistoma not porrect 10
10. Abdomen restricted basally, small species 11
    Abdomen not restricted basally, larger species ..... *Myiolepta*
11. Third antennal joint longer than wide; arista shorter than antennae ..... *Neoascia*
    Third antennal joint subquadrate; arista longer than antennae ..... *Sphegina*

Ferdinandea Rondani

Fallén (1817), Zetterstedt (1843), Lundbeck (1916), and Krüger (1926) have observed the larvae feeding upon exuding sap of trees, or in decaying wood and have described their life histories. Sack (1932) recorded the presence of the genus in ants' nests, but gave no reference to the species involved or the relationship to the ants.

Ferdinandea dives (Osten Sacken)

1877. *Chrysochlamys dives* Osten Sacken, West. Dipt., pp. 340-341.
1886. *Chrysochlamys dives* Williston, Synop. N. A. Syrph., pp. 241-242.
1924. *Ferdinandea dives* Shannon, Proc. Ent. Soc. Wash. 26:214.

One female labelled "Minn."; one male, St. Paul, May 13, 1934 (A. C. Hodson), fly trap.

Cheilosia Meigen

Réaumur (1740) mentioned and figured a puparium found in fungi, which Lundbeck (1916) believed to be of this genus. Dufour (1840, 1848) described the larva of *scutellata* (Fallén) from *Boletus,* and *vernalis* Fallén from decaying leaves. Van Roser (1834) reported the former species from rotten fungi; Scheffer (1848) and Boie (1850) recorded *mutabilis* (Fallén) and *albipila* Meigen from the roots and stalks of thistle and later investigators have also found them associated with thistle.

Certain members of this genus may be of economic importance in causing a blemish known as "black check" in timber. Burke (1905) described in detail the stages of a species under the name of *alaskensis* Hunter, which later proved to be *burkei* Shannon, and believed it to cause this particular injury to western hemlock.

Key to Species

1. Pile of vertexal triangle long, black; antennae brownish black (male) ..... *minnesotensis*
   Pile of vertexal triangle short, white; antennae reddish brown or orange 2

2. Scutellum with marginal bristles; facial tubercle abruptly enlarged (female) ..... *angelica*
Scutellum without marginal bristles; facial tubercle gradually enlarged (male) ..... *cottrelli*

Cheilosia angelica new species (Plate I, fig. 1)

FEMALE: Length, 8.5-9.0 mm.; facial tubercle abruptly rounded, subhemispherical; face pubescent; marginal bristles on scutellum.

HEAD: Face, cheeks, frontal and vertexal triangles, and occiput black in ground color; moderately short, silvery white pile everywhere present except face. Eyes with short sparse white pile; frontal triangle shining, punctate except small triangular area adjoining posterior portion of the lunule, latter reddish brown, glabrous, separating antennal pits and vertexal triangle, sparsely black pilose. Third antennal segment reddish brown, dorsal and distal portions brown, subquadrate, arista bare, black, proximal segments reddish brown, region between frontal suture and eye white pollinose on upper portion, remainder short white pilose, pile longer on cheeks. Facial tubercle bare, abruptly but evenly rounded, slightly below center of face and extending considerably beyond antennal prominence; face slightly pubescent.

THORAX: Dark, shining bluish green; dorsum with short white pile. Two long bristles and a series of smaller ones on lateral margins, posterior to transverse suture; a black bristle similarly placed directly anterior to transverse suture; posterior humeri usually with two black bristles. Scutellum with row of marginal black bristles, disc with moderately long white pile, venter with pile directed downward; pleura with short white pile except on pteropleura which is bare.

ABDOMEN: Of average length, concolorous with thorax, pile on disc white, subappressed, on lateral margin erect. First tergite ashy gray, second similar on anterior portion, remainder of second and succeeding tergites shining bluish black.

LEGS: Black with the following light-brown markings on anterior and middle legs: tips of coxae, tips of femora, bases and tips of tibiae, proximal portion of basitarsus; posterior legs similar, distal portion of tibiae much less, very narrow portion of basitarsus.

WINGS: Normal, infuscated.

This species is near *hunteri* Curran, the facial tubercle of the former is higher above oral margin, the face little more produced.

HOLOTYPE: Female, Grand Rapids, Minnesota, July 7, 1935 (C. E. Mickel, H. S. Telford) on *Angelica*.

PARATYPES: Four females, Grand Rapids, Minnesota, July 7, 1935 (C. E. Mickel, H. S. Telford) on *Angelica*.

Types deposited in the University of Minnesota collection.

Cheilosia cottrelli new species (Plate I, fig. 2)

MALE: Length 8.5 mm.; general color black with bluish reflection; facial tubercle prominent, gradually enlarged; third antennal segment orange; scutellar bristles absent; face bare.

HEAD: Pile sparse, few scattered white hairs on frontal triangle, latter coarsely punctate, separated by shallow groove; frontal lunule with small but distinct orange spot between antennae. Third antennal segment orange, subquadrate, first and second brown, arista bare, black. Area between frontal suture and eye pollinose on upper portion, sparsely pilose on lower portion. Cheeks with pile longer; face bare, slightly dusty below antennae; pile of eyes short, exceedingly sparse, almost entirely absent except on dorsal posterior portion. Tubercle gradually enlarged, situated slightly below middle of face, extending beyond antennal prominence.

THORAX: General color, shining bluish black with relatively thick yellow-white pile; black bristles on lateral margins immediately anterior and posterior to transverse suture. Similar bristles on upper portion of mesopleura and pteropleura; entire pleura otherwise pilose except pteropleura and basal portion of sternopleura. Scutellum with yellow-white pile on dorsum and venter, pile of latter directed downward.

ABDOMEN: Shining black with a bluish-black reflection; pile yellow-white subappressed on disc, longer and more erect on lateral margins; first three tergites subopaque, remainder shining.

LEGS: Black with the following brownish markings on anterior and middle legs: tips of femora, broadly on bases and tips of tibiae, venter of tarsi; posterior legs similar, brown restricted on tips of femora and darker.

WINGS: Normal.

Similar to *angelica* new species, but is easily distinguished by its broader tubercle, absence of marginal spines on scutellum and lack of pile on lower portion of sternopleura.

HOLOTYPE: Male, Itasca Park, Minnesota, June 1, 1935 (Robert Cottrell). Type deposited in the University of Minnesota collection.

Cheilosia minnesotensis new species (Plate I, fig. 3)

MALE: General color black with greenish-blue reflection; prominent evenly rounded facial tubercle; antennae reddish brown. Length 8 mm.

HEAD: Black in ground color; vertexal triangle and occiput black pilose, pile of latter diminishing in length toward eye, latter entirely pale pilose, sparser near vertex. Frontal triangle shining, punctate, thickly black pilose with distinct median groove; area between frontal suture and eye clothed with short white pile; face otherwise white pollinose. Facial tubercle prominent, evenly rounded, slightly below center of face. First and second antennal segments brown, third subquadrate, brown on dorsal and distal portions, otherwise reddish brown, arista bare, black.

THORAX: Shining black with greenish-blue reflection; dorsum with yellow and gray pile. Posterior humeri with ground color brown on posterior and anterior portions, disc with stout bristles. Scutellum with marginal black bristles, otherwise relatively long blackish pilose, venter with single row of white pile directed downward. Mesopleura with a long bristle directed posteriorly, remainder of pleura mostly white pilose.

ABDOMEN: Of moderate length, slender, brown on anterior corners of first tergite, slightly transversely rugose, otherwise black and white pile. Second tergite subopaque similarly rugosed with whitish-yellow pile; third finely and evenly punctate with golden pile; fourth entirely shining with greenish-blue reflection, pile on anterior half golden, on posterior half black. Sternites with scattered white pile.

LEGS: Black with the following light brown markings: extreme tip of anterior femora, entire tibia except broad ring in center, middle legs similar, posterior legs with narrow proximal portion of tibia; all tibiae and tarsi with bright golden pile beneath.

WINGS: Typical, slightly infuscated; halteres yellow with a prominent brown spot on knob.

This species resembles *burkei* Shannon more closely than any species which I have before me, but is decidedly distinct. It is distinguished from *burkei* by the more obtuse facial tubercle, absence of pile on face (except narrow border near eyes), in being more broadly brownish on legs, and by its more slender abdomen.

HOLOTYPE: Male, Hennepin County, Minnesota, May 21, 1925 (C. B. Philip).

PARATYPE: One male, Two Harbors, Minnesota, June 28, 1927 (Melville H. Hatch) on dandelion. Types deposited in the University of Minnesota collection.

Cartosyrphus Bigot

Key to Species

Humeri orange; posterior margin of scutellum orange-yellow *leucoparea*
Humeri and scutellum black ..... *tristis*

Cartosyrphus leucoparea (Loew)

1863. *Chilosia leucoparea* Loew, Berl. Ent. Zeit. 7:311.
1886. *Chilosia leucoparea* Williston, Synop. N. A. Syrph., pp. 45-46.
1896. *Chilosia leucoparea* Hunter, Can. Ent. 28:229-231.
1922. *Cartosyrphus leucoparea* Shannon, Insec. Inscit. Mens. 10: 127-135.

One female, St. Louis County, August 31, 1910; one female, Beltrami County, August 9, 1910.

Cartosyrphus tristis (Loew)

1863. *Chilosia tristis* Loew, Berl. Ent. Zeit. 7:312-313.
1886. *Chilosia pallipes* Williston, Synop. N. A. Syrph., pp. 41-42.
1922. *Cartosyrphus tristis* Shannon, Insec. Inscit. Mens. 10:127-135.

Three females, seven males; Hennepin, Hubbard, Ramsey, and Itasca counties; May 21 to August 27.

Orthoneura Macquart

Réaumur (1738) figured a rat-tailed maggot found in a tree cavity which Lundbeck (1916) believed to be closely related to this genus. Brauer (1883) found the larvae inhabiting swamps and marshes, apparently obtaining their nourishment from decaying leaves.

Key to Species

Vein M_{1+2} joins vein R_{4+5} beyond tips of vein R_{2+3}; eyes with linear markings ..... *nitida*
Vein M_{1+2} joins vein R_{4+5} before tips of vein R_{2+3}; eyes unicolorous ..... *pictipennis*

Orthoneura nitida (Wiedemann)

1830. *Chrysogaster nitida* Wiedemann, Auss. Zweifl. Ins. 2:116.
1886. *Chrysogaster nitida* Williston, Synop. N. A. Syrph., p. 35.
1916. *Chrysogaster nitida* Shannon, Proc. Ent. Soc. Wash. 18:102.

One female, Sedan, August 17, 1929 (Donald Denning); one male, Ramsey County, Battle Creek, May 20, 1922 (C. E. Mickel).

Orthoneura pictipennis Loew

1863. *Orthoneura pictipennis* Loew, Berl. Ent. Zeit. 7:306.
1886. *Chrysogaster pictipennis* Williston, Synop. N. A. Syrph., p. 37.

1916. *Chrysogaster pictipennis* Shannon, Proc. Ent. Soc. Wash. 18: 102.

Two females, two males; Ramsey, Clearwater, Big Stone, and Wadena counties; June 26 to August 15.

Chrysogaster Meigen

The larval habits of this genus are undoubtedly similar to the preceding closely related genus *Orthoneura*. Varley (1935) made a preliminary report on the habits of *hirtella* Loew; the larvae were found in the roots of the aquatic grass, *Glycera aquatica* Sm., and obtained oxygen by puncturing the roots with their needle-like point situated upon the posterior respiratory tube.

Chrysogaster nigripes Loew

1863. *Chrysogaster nigripes* Loew, Berl. Ent. Zeit. 7:307.
1886. *Chrysogaster nigripes* Williston, Synop. N. A. Syrph., pp. 33-34.
1916. *Chrysogaster nigripes* Shannon, Proc. Ent. Soc. Wash. 18:107.

One female, Eitzen, May 23, 1936 (C. E. Mickel).

Cnemodon Egger

Although their biology is very little known, the available data indicate that they are aphidophagous. Heeger (1858) described the developmental stages of *vitripennis* (Meigen) having observed them feeding upon coccids. Metcalf (1916) described the stages of *pisticoides* (Williston) and considered this species as a very important natural enemy of the woolly apple aphid in some localities. Heiss (1938) redescribed the larval stages of the same species.

Key to Species

1. Eyes dichoptic (females) 6
   Eyes holoptic (males) 2
2. Posterior trochanters normal ..... *intermedia*
   Posterior trochanters with spurs or tubercles 3
3. Posterior coxae with spur 5
   Posterior coxae without spur 4
4. Third abdominal sternite carinate at apex ..... *carinata*
   Third sternite normal ..... *pisticoides*
5. Middle coxae with slender process ..... *calcarata*
   Middle coxae normal ..... *coxalis*
6. Pile of venter appressed; median depression of frons transverse, broad, entire ..... *pisticoides*
   Pile of venter erect 7
7. Middle tibiae with distinct groove below ..... *intermedia*
   Middle tibiae with groove absent 8

8. Last section of vein Cu_2 almost straight; third antennal segment brown on dorsum ..... *coxalis*
Last section of vein Cu_2 bent at its middle; third antennal segment black on dorsum ..... *calcarata*

Cnemodon calcarata (Loew)

1865. *Pipiza calcarata* Loew, Berl. Ent. Zeit. 9:154.
1886. *Pipiza calcarata* Williston, Synop. N. A. Syrph., p. 24.
1921. *Cnemodon calcarata* Curran, Proc. Cal. Acad. Sci. 11:363-364.

One female, Ramsey County, University Farm, June 11, 1922 (A. A. Nichol); one female, Hennepin County, May 13, 1922 (A. A. Nichol), oak grove.

Cnemodon carinata Curran

1921. *Cnemodon carinata* Curran, Proc. Cal. Acad. Sci. 11:370-371.

One male, Crookston, July 16, 1935 (D. G. Denning); one male, St. Paul, June 10, 1935 (H. S. Telford).

Cnemodon coxalis Curran

1921. *Cnemodon coxalis* Curran, Proc. Cal. Acad. Sci. 11:366-367.

One male, Hennepin County, May 13, 1922 (A. A. Nichol), oak grove; one male, St. Anthony Park, May 21, 1919; one female, St. Anthony Park, June 22, 1921 (Wm. E. Hoffmann).

Cnemodon intermedia Curran

1921. *Cnemodon intermedia* Curran, Proc. Cal. Acad. Sci. 11:360-361.

One male, Ramsey County, June 11, 1923 (H. H. Knight); one male, Olmsted County (C. N. Ainslie).

Cnemodon pisticoides (Williston)

1886. *Pipiza pisticoides* Williston, Synop. N. A. Syrph., p. 29.
1921. *Cnemodon pisticoides* Curran, Proc. Cal. Acad. Sci. 11:368-369.

One female, St. Louis County, August 31, 1910; one male, St. Louis County, August 27, 1910.

Heryngia Rondani

There are no data available on the biology of our North American species, but the palaearctic forms are known to be aphidophagous. Heeger (1858) first ascribed this habit to *virens* (Fabr.). Goureau (1867) found *virens* among aphids and described its stages. Wachtl (1882) reared *heringi* (Zett.) from the galls of *Eriosoma lanuginosa* (Htg.) and concluded that the larvae fed upon this aphid. Sack (1928) recorded their feeding upon root-feeding aphids.

Heryngia salax (Loew)

1865. *Pipiza salax* Loew, Berl. Ent. Zeit. 9:152-153.
1886. *Pipiza pistica* Williston, Synop. N. A. Syrph., p. 29.
1921. *Heryngia salax* Curran, Proc. Cal. Acad. Sci. 11:355-356.

Two females, St. Paul, May 27, 1922 (A. A. Nichol) on *Spiraea;* one female, May 27, 1922 (A. A. Nichol) on basswood-maple; one male, Highwood, July 23, 1918 (Wm. A. Riley).

Pipizella Rondani

Little is known of the biology of this genus. Its affinity to the two preceding genera is unquestionable and the biology of the species is probably similar. Webster (1898) reared *modesta* (Loew) from apple twigs infested with *Eriosoma lanigera* (Hausm.).

Key to Species

Frontal triangle broadly opaque above, the lower margin angulated, yellow joints of the tarsi wholly without black hairs or bristles; pile on hind basitarsi very long and prominent ..... *banksi*
Frontal triangle scarcely opaque above, if opaque its lower margin transverse, at least apices of tarsal segments with black bristle above ..... *recedens*

Pipizella banksi Curran

1921. *Pipizella pulchella banksi* Curran, Proc. Cal. Acad. Sci. 11: 349-350.
1923. *Pipizella banksi* Curran, Trans. Amer. Ent. Soc. 49:343-344.

One female, Hennepin County (O. W. Oestlund).

Pipizella recedens (Walker)

1852. *Chrysogaster recedens* Walker, Insecta Saund. Dipt. 1:228.
1921. *Pipizella fraudulenta* Curran, Proc. Cal. Acad. Sci. 11:352-353.
1923. *Pipizella recedens* Curran, Trans. Amer. Ent. Soc. 49:343.

Five females, Delorme, Polk County, July 2, 1935 (D. G. Denning); nine females, Delorme, Polk County, July 5, 1935 (D. G. Denning); one female, Swan River, July 2, 1935 (D. G. Denning).

Neoascia Williston

Lundbeck (1916) first described the larvae and the puparia of *floralis* (Meigen) and *geniculata* (Meigen) which were taken from flood refuse. He does not believe them to be aphidophagous as they possess no mouth hooks; he suggests a more or less aquatic existence on account of the presence of a typical telescopic posterior respiratory process. They were not found in the water, but only in a moist environment. Sack (1929) found the puparium of *podagrica* (Fabr.) in a damp place and figured it.

Neoascia globosa (Walker)

1849. *Ascia globosa* Walker, List Dipt. Ins. 3:546.
1886. *Neoascia globosa* Williston, Synop. N. A. Syrph., p. 111.
1925. *Neoascia globosa* Curran, Proc. Ent. Soc. Wash. 27:61-62.

Nine females, seven males; Ramsey, Cook, Pine, Hennepin, and Beltrami counties; May 20 to September 5.

Sphegina Meigen

Sack (1929) described the larvae and puparia of *clunipes* (Fallén). They were found living in moist soil in a branch of a tree.

Sphegina flavimana Malloch

1922. *Sphegina flavimana* Malloch, Proc. Biol. Soc. Wash. 35:143.
1922. *Sphegina flavimana* Malloch, Ent. News 33:266-270.
1935. *Sphegina flavimana* Hull, Trans. Amer. Ent. Soc. 61:373-382.

One male, Lake Minnetonka, Hennepin County, June 14, 1932 (D. G. Denning).

Rhingia Scopoli

Réaumur (1738) recorded rearing a single specimen of *campestris* Meigen from cow dung, although he did not see the larva or puparium. Krüger (1926) described the internal and external anatomy of the same species which was also discovered in cow dung.

Rhingia nasica Say

1823. *Rhingia nasica* Say, Jour. Acad. Nat. Sci. Phil. 3:94.
1886. *Rhingia nasica* Williston, Synop. N. A. Syrph., p. 130.

Eight females, thirteen males; Houston, Le Sueur, Olmsted, Hubbard, Ramsey, and Hennepin counties, May 14 to July 27.

Myiolepta Newman

Becher (1882) described the larva and puparium of *obscura* Becher and the puparium of *luteola* (Gmelin); both had been discovered in a hollow poplar. Greene (1923b) described the puparium of *nigra* Loew which was found in a hole of a tulip tree. Curran (1925d) observed females of this genus depositing eggs in the crevices of trees from which sap was exuding. This is evidence that they may feed upon sap as do *Ferdinandea* and others.

Myiolepta nigra Loew

1872. *Myiolepta nigra* Loew, Berl. Ent. Zeit. 16:84.
1886. *Myiolepta nigra* Williston, Synop. N. A. Syrph., p. 129.
1913. *Myiolepta nigra* Hine, Ohio. Nat. 14:205-210.

Two females, Olmsted County (C. N. Ainslie).

SERICOMYINAE

Key to Genera

Post-alar calli and margin of scutellum with stout bristles; vein R_{4+5} distinctly bent into cell R_5 ..... *Condidea*
Thorax without bristles; vein R_{4+5} very slightly bent into cell R_5 ..... *Sericomyia*

Condidea Coquillett

The immature stages are unknown.

Condidea lata Coquillett

1907. *Condidea lata* Coquillett, Can. Ent. 39:75.

One female, Itasca Park, June 25, 1921 (H. L. Person); one female, Olmsted County (C. N. Ainslie); one female, McFarland Lake, Cook County, July 30, 1936 (C. E. Mickel).

Sericomyia Meigen

Little is known of the biology of the genus. Bloomfield (1897) recorded the presence of the larvae of *borealis* (Fallén) in a shallow pool of a peat bog. They were typically rat-tailed.

Sericomyia militaris Walker

1849. *Sericomyia militaris* Walker, List Dipt. Ins. 3:595.
1886. *Sericomyia militaris* Williston, Synop. N. A. Syrph., pp. 155-156.

Eleven females, seven males; Cook, Hubbard, and St. Louis counties; July 7 to September 31.

VOLUCELLINAE

Key to Genera

Arista bushy plumose, appearing strap-like ..... *Copestylum*
Arista loosely plumose ..... *Volucella*

Copestylum Macquart

Williston (1891) reared *marginatum* (Say) from larvae feeding upon the tissues of the cactus *Opuntia missouriensis.*

Hunter *et al.* (1912) also observed this species on cacti and briefly described the larva and the oviposition habits of the adults.

Copestylum caudatum Curran

1927. *Copestylum caudatum* Curran, Ent. News 38:45-46.
1930. *Copestylum caudatum* Curran, Amer. Mus. Nov. 413:3.

One female, Luverne, September 14, 1935 (A. E. Pritchard). Probably feeds on the few species of cacti occurring in Rock County.

Volucella Geoffroy

The larvae of certain species of the members of this genus have been found inhabiting the nests of *Bombus* and *Vespa.* Without question the most important work is that of Künckel d'Herculais (1875). His excellent monograph contains a complete bibliography of the earlier literature, a detailed discussion on the external and internal anatomy, and descriptions of their immature stages.

The genus *Volucella* contains species which are similar in habits to *Copestylum.* Williston (1891) observed *fasciata* Macquart on *Opuntia missouriensis,* and Hubbard (1899) recorded the larvae of *avida* Osten Sacken living in decomposing cacti. Krüger (1926) recorded the larvae of *pellucens* (Linné) in the nests of *Vespa vulgaris* Linné and described in some detail the external and internal anatomy of the larva.

Key to Species

1. Densely pilose 2
   Pile short, thin, subappressed ..... *fasciata*
2. First, second, and fifth abdominal tergites with yellow and red pile ..... *bombylans evecta*
   Pile of first and second abdominal tergites yellow, the remaining tergites with black pile ..... *bombylans americana*

Volucella bombylans americana Johnson

1916. *Volucella bombylans* form *americana* Johnson, Psyche 23:162.
1925. *Volucella bombylans evecta* var. *americana* Johnson, Psyche 32:116.
1926. *Volucella bombylans* varieties Curran, Ann. Ent. Soc. Amer. 19:50-66.
1930. *Volucella bombylans americana* Curran, Amer. Mus. Nov. 413:23.

One female, Ramsey County, July 13, 1910.

Volucella bombylans evecta Walker

1856. *Volucella evecta* Walker, Insecta Saund. Dipt. 1:251.
1886. *Volucella evecta* Williston, Synop. N. A. Syrph., pp. 136-137.
1916. *Volucella bombylans evecta* Johnson, Psyche 23:159-163.
1925. *Volucella bombylans evecta* Johnson, Psyche 32:116.
1926. *Volucella bombylans evecta* Curran, Ann. Ent. Soc. Amer. 19: 50-66.
1930. *Volucella bombylans evecta* Curran, Amer. Mus. Nov. 413:23.

One male, Warroad, July 16, 1925 (C. B. Philip); one female, Itasca Park, August 4, 1921 (H. L. Person).

Volucella fasciata Macquart

1842. *Volucella fasciata* Macquart, Mem. Soc. Sci. Lille, pp. 82-83 (1841).
1886. *Volucella fasciata* Williston, Synop. N. A. Syrph., p. 145.
1930. *Volucella fasciata* Curran, Amer. Mus. Nov. 413:10.

One female, Luverne, September 13, 1935 (H. S. Telford); one female, Luverne, September 13, 1935 (C. E. Mickel); two males, four females, Rock County, June 3, 1938 (C. E. Mickel).

Probably associated with cacti in Rock County.

ERISTALINAE

Key to Genera

1. Cell R_3 open 3
   Cell R_3 closed 2
2. Eyes unicolorous ..... *Eristalis*
   Eyes with numerous brown spots ..... *Lathyrophthalmus*
3. Large, robust, thorax thickly yellow or orange pilose; posterior femora swollen and arcuate ..... *Mallota*
   Smaller and more slender; if posterior femora are arcuated, the tibiae end in an apical spur 4
4. Posterior tibiae ending in a spur or triangular projection 5
   Posterior tibiae transverse or rounded apically 6
5. Large, at least 12 mm. in length; mesonotum at most obscurely vittate ..... *Polydontomyia*
   Smaller, more slender; mesonotum distinctly vittate ..... *Lejops*
6. Face entirely pollinose ..... *Parhelophilus*
   Face with narrow stripe bare 7
7. Stigma simulating a crossvein; ocellar triangle large, the outer ocelli lying close to compound eyes ..... *Asemosyrphus*
   Stigma more than twice as long as wide, never simulating a crossvein ..... *Elophilus*

Lathyrophthalmus Mik

Although *aeneus* (Fabr.) is an exceedingly common cosmopolitan species, its developmental stages were apparently unknown until Metcalf (1916) described the larva and puparium which had been taken from a sewage disposal plant. They are

similar to the well known rat-tailed larvae of *Eristalis,* but somewhat smaller. It is possible that they hibernate in Minnesota as adults since specimens have been taken early in March in crevices of more or less exposed sandstone caves. The larvae apparently live upon decomposing plant and animal matter in an aquatic or semiaquatic environment.

Lathyrophthalmus aeneus (Scopoli)

1763. *Conops aeneus* Scopoli, Ent. Carn., pp. 356-357.
1886. *Eristalis aeneus* Williston, Synop. N. A. Syrph., pp. 161-162.
1925. *Eristalis aeneus* Hull, Ohio Jour. Sci. 25:292.
1930. *Lathyrophthalmus aeneus* Curran, Amer. Mus. Nov. 411:3.

Five females, Ramsey County; March 8 to July 24.

Eristalis Latreille

The larvae and puparia of this genus have long been known. Swammerdam (1738) and Réaumur in the same year recorded in some detail the immature stages of a species which was probably *tenax* (Linné). Since then numerous investigators have published on various species. The most extensive work is by Buckton (1895) who discusses at great length the classification, life history, morphology, physiology, histology, development, distribution, and myths of *tenax* (Linné) and *arbustorum* (Linné). They inhabit moist putrefying materials, are rat-tailed, and are often found in carrion.

Members of this genus have received much attention as facultative intestinal parasites of man and animals. Reports of myiasis in man are not an uncommon occurrence.

Gäbler (1930) made a rather complete comparative study of the tracheal system of six species of *Eristalis.*

The females of the drone fly or *tenax* (Linné) have been found hibernating gregariously in crevices and holes of sandstone caves near St. Paul. Whether only the females hibernate in a fertilized condition or pass the winter in some other stage of their development or both is a matter for further observation.

Key to Species

1. Third tergite of abdomen shining 2
   Third tergite of abdomen with opaque markings 4
2. Hind tarsi testaceous to rufescent, densely pilose ..... *flavipes*
   Hind tarsi dark brown or black 3
3. Basal portion of hind tibiae light yellow ..... *latifrons*
   Hind tibiae entirely dark brown or black, pile of eyes usually restricted to a broad vertical stripe ..... *tenax*
4. Thorax fasciate, scutellum bright yellow ..... *transversus*
   Thorax unicolorous, sometimes indistinctly vittate, scutellum glossy 5

5. Pile black on anterior portion of posterior calli ..... *dimidiatus*
   Pile on posterior calli yellow 6
6. Densely pilose ..... *bastardii*
   Bare or pubescent 7
7. Middle tarsi partly yellow 8
   Middle tarsi entirely black or brown ..... *brousi*
8. Basal two joints of middle tarsi yellow; face with a shining black stripe ..... *nemorum*
   Only the basitarsi of middle leg yellow; face entirely pilose ..... *arbustorum*

Eristalis arbustorum (Linné)

1758. *Musca arbustorum* Linné, Syst. Nat., 10th ed., p. 591.
1925. *Eristalis arbustorum* Hull, Ohio Jour. Sci. 25:309-310.
1930. *Eristalis arbustorum* Curran, Amer. Mus. Nov. 411:3-7.

Numerous specimens; Hennepin, Douglas, Rice, Ramsey, Martin, and Anoka counties; from April 23 to August 16.

Eristalis bastardii Macquart

1842. *Eristalis bastardii* Macquart, Mem. Soc. Sci. Lille, p. 95 (1841).
1886. *Eristalis bastardii* Williston, Synop. N. A. Syrph., p. 168.
1925. *Eristalis bastardi* Hull, Ohio Jour. Sci. 25:80.
1930. *Eristalis bastardi* Curran, Amer. Mus. Nov. 411:3-7.

Numerous specimens; Olmsted, Ramsey, Crow Wing, Anoka, Clearwater, Hennepin, Todd, Polk, Houston, Traverse, Lake, Chisago, and Aitkin counties; May 8 to September 19.

Eristalis brousi Williston

1882. *Eristalis brousi* Williston, Proc. Amer. Phil. Soc. 20:323.
1886. *Eristalis brousi* Williston, Synop. N. A. Syrph., pp. 165-166.
1925. *Eristalis brousi* Hull, Ohio Jour. Sci. 25:310.
1930. *Eristalis brousi* Curran, Amer. Mus. Nov. 411:3-7.

Numerous specimens; Ramsey, Steele, St. Louis, Hennepin, Beltrami, Olmsted, and Douglas counties; May 14 to September 12.

Eristalis dimidiatus Wiedemann

1828. *Eristalis dimidiatus* Wiedemann, Auss. Zweifl. Ins. 2:180-181.
1886. *Eristalis dimidiatus* Williston, Synop. N. A. Syrph., p. 162.
1925. *Eristalis dimidiatus* Hull, Ohio Jour. Sci. 25:295.
1930. *Eristalis dimidiatus* Curran, Amer. Mus. Nov. 411:3-7.

Numerous specimens; Cook, Ramsey, Washington, Hennepin, Clearwater, St. Louis, Ottertail, Todd, Pope, Anoka, Hubbard, Freeborn, Beltrami, and Rock counties; April 27 to September 11.

Eristalis flavipes Walker

1849. *Eristalis flavipes* Walker, List Dipt. Ins. 3:633.
1886. *Eristalis flavipes* Williston, Synop. N. A. Syrph., p. 168.
1925. *Eristalis flavipes* Hull, Ohio Jour. Sci. 25:23-24.
1930. *Eristalis flavipes* Curran, Amer. Mus. Nov. 411:3-7.

Numerous specimens; Rock, Hennepin, Cook, Ramsey, Clearwater, and Lake counties; May 19 to October 14.

Eristalis latifrons Loew

1865. *Eristalis latifrons* Loew, Berl. Ent. Zeit. 9:169-170.
1886. *Eristalis latifrons* Williston, Synop. N. A. Syrph., p. 164.
1925. *Eristalis latifrons* Hull, Ohio Jour. Sci. 25:295.
1930. *Eristalis latifrons* Curran, Amer. Mus. Nov. 411:3-7.

Numerous specimens; Steele, Anoka, Hennepin, Todd, Hubbard, Pope, Olmsted, Roseau, Stearns, Clearwater, Washington, Cook, Lincoln, Rice, Ramsey, Lake, and Rock counties; from May 13 to September 19.

Eristalis nemorum (Linné)

1758. *Musca nemorum* Linné, Syst. Nat., 10th ed., p. 591.
1925. *Eristalis nemorum* Hull, Ohio Jour. Sci. 25:301-302.
1930. *Eristalis nemorum* Curran, Amer. Mus. Nov. 411:3-7.

One male, Kadence Creek, Lake Superior Shore, August 8, 1929 (Wm. C. Stehr).

Eristalis tenax (Linné)

1758. *Musca tenax* Linné, Syst. Nat., 10th ed., p. 591.
1886. *Eristalis tenax* Williston, Synop. N. A. Syrph., p. 160.
1925. *Eristalis tenax* Hull, Ohio Jour. Sci. 25:305.
1930. *Eristalis tenax* Curran, Amer. Mus. Nov. 411:3-7.

Numerous specimens; Ramsey, Rock, Hennepin, Cook, Hubbard, Chisago, Roseau, Clearwater, Freeborn, Houston, Nicollet, Olmsted, and Todd counties; May 5 to October 21.

Eristalis transversus Wiedemann

1828. *Eristalis transversus* Wiedemann, Auss. Zweifl. Ins. 2:188-189.
1886. *Eristalis transversus* Williston, Synop. N. A. Syrph., p. 170.
1925. *Eristalis transversus* Hull, Ohio Jour. Sci. 25:41.
1930. *Eristalis transversus,* Curran, Amer. Mus. Nov. 411:3-7.

Numerous specimens; Clearwater, Todd, Olmsted, Ramsey, Anoka, Houston, Cass, and Le Sueur counties; May 27 to August 28.

Mallota Meigen

Becher (1882) described the stages of *eristaloides* Loew =*cimbiciformis* (Fallén), having found the larvae and puparia in a hollow poplar. Lintner in the same year reported *posticata* (Fabr.) larvae from a decomposing birch tree and described the larval and pupal stages. Lundbeck (1916) examined larvae from cavities in maple and birch and mentioned their similarity to *Eristalis*.

Key to Species

1. Eyes pilose ..... *posticata*
   Eyes bare 2
2. Pile of abdominal tergum white ..... *illinoiensis*
   Pile of abdominal tergum variable 3
3. Pile of abdominal tergum black, except part of first tergite which is yellow ..... *cimbiciformis*
   Pile of last abdominal tergite in male and last two in female with orange or yellowish pile ..... *facialis*

Mallota cimbiciformis (Fallén)

1817. *Syrphus cimbiciformis* Fallén, Syrph. Suec., p. 27.
1886. *Mallota cimbiciformis* Williston, Synop. N. A. Syrph., pp. 202-204.
1931. *Mallota cimbiciformis* Curran, Bul. Amer. Mus. Nat. Hist. 61:74.

Four females, three males; Wabasha, Ramsey, Norman, Cook, Hubbard, and Red Lake counties; May 27 to July 29.

Mallota facialis Hunter

1896. *Mallota facialis* Hunter, Can. Ent. 28:100.
1917. *Mallota flavoterminata* Jones, Ann. Ent. Soc. Amer. 10:228-229.
1931. *Mallota facialis* Curran, Bul. Amer. Mus. Nat. Hist. 61:74.

One female, Houston County; May 23, 1936 (Robert Cottrell).

Mallota illinoiensis Robertson

1901. *Mallota illinoiensis* Robertson, Can. Ent. 33:284-285.
1931. *Mallota illinoiensis* Curran, Bul. Amer. Mus. Nat. Hist. 61:74.

One male, Ft. Snelling, July 29, 1925 (R. W. Dawson), high prairie.

Mallota posticata (Fabricius)

1805. *Eristalis posticata* Fabricius, Syst. Antl., p. 237.
1886. *Mallota posticata* Williston, Synop. N. A. Syrph., pp. 201-202.
1931. *Mallota posticata* Curran, Bul. Amer. Mus. Nat. Hist. 61:74.

One female, Olmsted County (C. N. Ainslie); one male, Ramsey County, June 5, 1923 (H. H. Knight).

Polydontomyia Williston

The developmental stages are unknown. Johannsen (1935) described a puparium which bore the label *"Tridonta curvipes"* followed by a question mark. Since the adult was not reared and as no further records were available, his description of this specimen as a *Polydontomyia* cannot be depended upon.

Polydontomyia curvipes (Wiedemann)

1828. *Merodon curvipes* Wiedemann, Auss. Zweifl. Ins. 2:149.
1886. *Triodonta curvipes* Williston, Synop. N. A. Syrph., p. 206.

One male, Big Stone County, July 20, 1910; one male, St. Paul, University Farm, June 15, 1934 (John Hitchcock); one female, Traverse County (O. W. Oestlund); one male, Lincoln County, July 26, 1938 (C. E. Mickel).

Elophilus Meigen

The immature stages are well known. Réaumur (1738) recorded a species which Lundbeck (1916) believed to be *pendulus* (Linné), living in putrid water. Lundbeck (1916) examined larvae of *groenlandicus* (Fabr.) and *borealis* (Staeg.) and reported them similar in all respects to *Eristalis*. Our most common species, *latifrons* (Loew), has been described by Lintner (1891) and by Jones (1922). In both instances they were found in stagnant water, obtaining their oxygen by a long posterior respiratory appendage.

Key to Species

1. Face with median black stripe 2
   Face with median yellow or reddish stripe 3
2. Thoracic vittae reduced to narrow stripes; hind femora reddish at base ..... *obscurus*
   Thoracic vittae broad; hind femora black, except apical end *hybridus*
3. Front of male narrowed to less than width of antennal pits; front of female entirely black pilose ..... *fasciatus*
   Front of male much wider than width of antennal pits; female with yellow pile on lower portion of front ..... *latifrons*

Elophilus fasciatus (Walker)

1842. *Helophilus similis* Macquart, Mem. Soc. Sci. Lille, pp. 124-125 (1841).
1849. *Helophilus fasciatus* Walker, List Dipt. Ins. 3:605.
1886. *Helophilus similis* Williston, Synop. N. A. Syrph., p. 189.
1926. *Helophilus fasciatus* Curran and Fluke, Trans. Wis. Acad. Sci. 22:220-223.

Numerous specimens; St. Louis, Beltrami, Cook, Koochiching, Ramsey, Clearwater, Roseau, Lake, Hubbard, Anoka, Olmsted, and Rock counties; May 14 to September 14.

Elophilus hybridus (Loew)

1846. *Helophilus hybridus* Loew, Stett. Ent. Zeit. 7:141-142.
1926. *Helophilus hybridus* Curran and Fluke, Trans. Wis. Acad. Sci. 22:225-227.

Six females, three males; Roseau, Hubbard, and Hennepin counties; June 2 to August 13.

Elophilus latifrons (Loew)

1863. *Helophilus latifrons* Loew, Berl. Ent. Zeit. 7:313-314.
1886. *Helophilus latifrons* Williston, Synop. N. A. Syrph., p. 188.
1926. *Helophilus latifrons* Curran and Fluke, Trans. Wis. Acad. Sci. 22:216-219.

Numerous specimens; Hennepin, Carlton, Swift, Wadena, Roseau, Benton, Polk, St. Louis, Ramsey, Olmsted, Anoka, Koochiching, Houston, Dakota, Aitkin, Washington, and Rock counties; May 7 to September 10.

Elophilus obscurus (Loew)

1863. *Helophilus obscurus* Loew, Berl. Ent. Zeit. 7:314.
1886. *Helophilus obscurus* Williston, Synop. N. A. Syrph., p. 196.
1926. *Helophilus obscurus* Curran and Fluke, Trans. Wis. Acad. Sci. 22:228-229.

One female, St. Louis County, Burntside Lake, August 27, 1918 (Vernon R. Haber); one female, Itasca, June 25, 1914 (S. A. Graham).

Parhelophilus Girschner

Although there are no published data on the biology of the species of this genus, their habits are undoubtedly similar to *Elophilus* and *Lejops*. The author has examined puparia of *laetus* (Loew) which are typically rat-tailed suggesting an aquatic or semiaquatic existence.

Key to Species

1. Thoracic dorsum not vittate; front yellow pilose ..... *obsoletus*
   Thoracic dorsum vittate; front at least partly black pilose 2
2. Hind femora black except extreme apical portions; abdominal dorsum opaque black with yellowish-white or red markings ..... *rex*
   Hind femora with yellow predominating; abdomen mostly yellow or reddish yellow ..... *laetus*

Parhelophilus laetus (Loew)

1863. *Helophilus laetus* Loew, Berl. Ent. Zeit. 7:315.
1886. *Helophilus laetus* Williston, Synop. N. A. Syrph., p. 189.

1926. *Parhelophilus laetus* Curran and Fluke, Trans. Wis. Acad. Sci. 22:241-243.

Numerous specimens; Ramsey, Nicollet, Hennepin, Houston, Traverse, Anoka, Freeborn, and Olmsted counties; April 24 to September 1.

Parhelophilus obsoletus (Loew)

1863. *Helophilus obsoletus* Loew, Berl. Ent. Zeit. 7:314.
1886. *Helophilus obsoletus* Williston, Synop. N. A. Syrph., p. 196.
1926. *Parhelophilus obsoletus* Curran and Fluke, Trans. Wis. Acad. Sci. 22:246-247.

One male, Itasca Park, May 20, 1928 (L. W. Orr); one male, Ramsey County; one male, Cass County, June, 1899 (O. W. Oestlund).

Parhelophilus rex Curran and Fluke

1926. *Parhelophilus rex* Curran and Fluke, Trans. Wis. Acad. Sci. 22:234-237.

One male, Itasca Park, May 29, 1934 (C. Y. Liu); one female, Itasca Park, August 7, 1928 (L. W. Orr).

Lejops Rondani

Metcalf (1916) reared the larva of *conostoma* (Williston) = *stipatus* (Walker) from decomposing human faeces. Sack (1931) states, " . . . . die Larven wahrscheinlich im Schlamme stehender Gewässer." The author has collected and reared specimens of *bilinearis* (Williston) from temporary ponds in April; they are the long-tailed type; the puparia closely resemble those of *Parhelophilus*.

Key to Species

1. Face produced into a long acute cone ..... *stipatus*
   Face not greatly produced 2
2. Abdomen long, cylindrical, generally narrowed toward apex; front narrowed (males) 3
   Abdomen of average length, margins subparallel; front broad (females) 6
3. Posterior trochanters produced; their tibiae ending in a spur 4
   Posterior trochanters normal; their tibiae simple or only slightly produced 5
4. Process on posterior trochanters short; their tibiae with long acute spur ..... *chrysostomus*
   Process on posterior trochanters long, obtuse; their tibiae with spur of moderate length, obtuse ..... *relictus*
5. Thoracic vittae narrow, sometimes interrupted; abdomen without lunules beyond second abdominal tergite ..... *bilinearis*

Thoracic vittae broad, entire; lunules on third and fourth abdominal tergites ..... *lunulatus*

6. Second pair of lunules on abdominal tergum separated from margins; apices and margins of tergites yellow ..... *bilinearis*
   Second pair of lunules on abdominal tergum reach margins 7
7. Posterior femora mostly black; tibial spur somewhat produced ..... *relictus*
   Posterior femora with yellow predominating; tibial spur reduced 8
8. Inner apical portion of lunulate bands on second abdominal tergite broad, occupying almost one-third of length of tergite ..... *chrysostomus*
   Inner apical portion of lunulate bands on second abdominal tergite narrow, occupying much less than one-third length of tergite ..... *lunulatus*

Lejops bilinearis (Williston)

1886. *Helophilus bilinearis* Williston, Synop. N. A. Syrph., pp. 295-296.

1926. *Lejops bilinearis* Curran and Fluke, Trans. Wis. Acad. Sci. 22:267-270.

One male, Ft. Snelling, May 6, 1922 (Wm. E. Hoffmann), flood plain forest; one female, Ramsey County, May 17, 1923 (C. E. Mickel); one male, Norman County, June 27, 1923 (A. A. Nichol); one female, St. Paul, April 19, 1936 (A. B. Gurney, H. S. Telford) reared from larva taken from a temporary pool.

MATURE LARVA: Body length, 15 mm. (exclusive of breathing tube), width, 3.0-3.5 mm., grayish white, typically rat-tailed in contour with a long posterior respiratory tube; venter with seven pairs of prolegs each bearing crochets, first pair less developed with a group of scattered short spines, remaining prolegs with a definite double row of crochets.

Mouth parts situated between and anterior to first pair of prolegs, surrounded on either side with two broad tubercles; antennae adjoining and directly above oral margin, united at their base, latter stout and fleshy, second segment sclerotized and bears two very small heavily sclerotized appendages; a pair of anterior cornua situated upon dorsal anterior surface, slightly extending above integument, also with numerous short spines concolorous with integument, sparser toward posterior portion of body; dorsum thrown into numerous transverse folds.

Body segments indiscernible; two large undulating dorsal tracheal trunks observed in living specimens but lost soon after death.

Posterior respiratory tube when entirely telescoped 10 mm. in length, divided into three distinct sections. Entire first portion of first section transversely wrinkled and relatively broad, gradually smaller toward its distal portion where it is smooth and tubular, two pairs of branched hairs situated along lateral distal

portion of wrinkled first section. Second section much smaller and telescoped within first, more heavily sclerotized; this section may be entirely obscured by its telescoping within the first or may be extended at least 4-5 mm. Last section more heavily sclerotized, much smaller in diameter, brown on proximal, lighter on extreme distal portions; a series of fine short black hairs directed backward on subdistal portion; several long, slender, transparent hairs, radially arranged subequal in length to last section protrude from extreme distal portion.

PUPARIUM: Similar in contour to larva, shorter, 6-7 mm., more robust, darker, approaching a dirty brown; anterior portion directed abruptly downward forming a trapezoid, dorsal portion of latter with a pair of prominent tubular cornua, distance between them subequal to their length; two cornua on extreme anterior portion much smaller, inconspicuous, distance between them subequal to distance between dorsal cornua.

Lejops chrysostomus (Wiedemann)

1830. *Eristalis chrysostoma* Wiedemann, Auss. Zweifl. Ins. 2:174.
1886. *Helophilus chrysostomus* Williston, Synop. N. A. Syrph., pp. 190-192.
1926. *Lejops chrysostomus* Curran and Fluke, Trans. Wis. Acad. Sci. 22:261-263.

Two females, Ramsey County.

Lejops lunulatus (Meigen)

1822. *Syrphus lunulatus* Meigen, Syst. Beschr. 3:299-300.
1926. *Lejops lunulatus* Curran and Fluke, Trans. Wis. Acad. Sci. 22:263-267.

Two females, three males; Hennepin and Ramsey counties; May 20 to June 1.

Lejops relictus Curran and Fluke

1926. *Lejops relictus* Curran and Fluke, Trans. Wis. Acad. Sci. 22: 256-259.

One male, St. Peter, Fish Hatchery, July 20, 1922 (Wm. E. Hoffmann); one female, Washington County, July 8, 1910; two males, Anoka County, Moore's Lake, June 19, 1925 (C. B. Philip); one male, Anoka County, Moore's Lake, August 3, 1924 (C. B. Philip).

Lejops stipatus (Walker)

1849. *Helophilus stipatus* Walker, List Dipt. Ins. 3:602.
1886. *Helophilus conostomus* Williston, Synop. N. A. Syrph., pp. 193-194.

1926. *Lejops stipatus* Curran and Fluke, Trans. Wis. Acad. Sci. 22: 274-276.

Numerous specimens; Ramsey, Nicollet, Chisago, Anoka, Big Stone, Olmsted, Sherburne, and Pope counties; from May 27 to August 18.

Asemosyrphus Bigot

The immature stages are unknown.

Asemosyrphus willingii (Smith)

1912. *Helophilus willingii* Smith, Proc. Ent. Soc. Wash. 14:118-119.
1926. *Asemosyrphus willingii* Curran and Fluke, Trans. Wis. Acad. Sci. 22:250-252.

One female, Big Stone County (O. W. Oestlund).

MILESINAE

Milesia Latreille

The immature stages are unknown.

Milesia virginiensis (Drury)

1773. *Musca virginiensis* Drury, Illus. Nat. Hist. 2:73.
1805. *Milesia ornata* Fabricius, Syst. Antl., p. 188.
1886. *Milesia ornata* Williston, Synop. N. A. Syrph., pp. 255-256.
1924. *Milesia virginiensis* Hull, Ent. News 35:280-282.

Three males, St. Peter, Fish Hatchery, July 22, 1922 (Wm. E. Hoffmann).

HELIOPHILINAE[1]

Key to Genera

1. Antennae situated upon a prominent antennal projection; abdominal tergites with four pairs of large golden spots; wasp-like *Somula*
   Antennal projection only slightly produced; abdomen variable 2
2. Large, densely pilose, resembling bumblebees ..... *Criorrhina*
   Smaller, thinly pilose or pubescent 3
3. Abdominal tergum with narrow, hoary, broadly interrupted bands ..... *Citibaena*
   Abdominal tergum with yellow or orange pollinose bands or none 4
4. Abdominal tergum with several yellow and orange pollinose bands 5
   Abdominal tergum without yellow or orange pollinose bands 6
5. Posterior femora simple ..... *Temnostoma*
   Posterior femora with tooth-like projection below, near apical end 9

[1] Since the re-establishment of *Heliophilus* Meigen as a valid genus (Curran, 1934), relegating *Xylota* Meigen to synonymy, the name of the subfamily must be changed from Xylotinae (Shannon, 1922a) to Heliophilinae, since *Xylota* was the type genus of the subfamily.

6. Posterior femora with triangular projection apically; face carinate ..... *Tropidia*
   Posterior femora simple, face variable 7
7. Posterior femora greatly swollen; head globose, cheeks linear *Syritta*
   Posterior femora normal or slightly enlarged, head not globose 8
8. Posterior femora with low ridge on apical fourth, bearing stout short spinose setae ..... *Heliophilus*
   Posterior femora normal; face yellow ..... *Cynorhina*
9. Posterior tibiae with subbasal tooth; body unicolorous *Brachypalpus*
   Posterior tibiae simple; body with yellow markings, wasp-like ..... *Spilomyia*

Heliophilus Meigen

The developmental stages of *Heliophilus* larvae have long been known. The species *pigra* (Fabr.) was described by Westwood (1840), Perris (1870), Daecke (1903), Johnson (1906), Green (1923b), and Heiss (1938); the species *segnis* (Linné) by Beling (1875), and Lundbeck (1916); *florum* (Fabr.) by Westwood (1840); *lenta* (Meigen) by Scholtz (1850); *nemorum* (Fabr.) by Lundbeck (1916), and Heiss (1938); *bicolor* (Loew) by Johnson (1913) and Greene (1923b); *fraudulosa* Loew (= *baton* Walker) and *rileyi* (Williston) by Heiss (1938). They were all found in decomposing wood and other organic plant matter.

Key to Species

1. Entirely black; wings infuscated ..... *chalybea*
   Not entirely black, although legs only may be light 2
2. Part of second abdominal tergite and tergites following, red or reddish yellow ..... *pigra*
   Tergites beyond second tergite not red or reddish yellow 3
3. Anterior, middle, and basal two thirds of posterior femora yellow or yellowish orange 4
   Femora black 5
4. Coxae yellow or yellowish orange ..... *vecors*
   Coxae black ..... *curvipes satanica*
5. Second and third abdominal tergites with a broad interrupted yellow or orange cross band 6
   Second abdominal tergite with two oblong, narrowly separated yellow or luteus spots in male; in female lacking, otherwise black ..... *angustiventris*
6. Metasternum pilose; hind trochanters of male not spurred *nemorum*
   Metasternum short pubescent; hind trochanters of male spurred ..... *ejuncida*

Heliophilus angustiventris (Loew)

1865. *Xylota angustiventris* Loew, Berl. Ent. Zeit. 9:164.
1886. *Xylota angustiventris* Williston, Synop. N. A. Syrph., p. 232.
1926. *Xylota angustiventris* Shannon, Proc. U. S. Nat. Mus. 69: 36-37.

One female, Rochester, June 14, 1922 (C. E. Mickel).

Heliophilus chalybea (Wiedemann)

1828. *Xylota chalybea* Wiedemann, Auss. Zweifl. Ins. 2:98.
1886. *Xylota chalybea* Williston, Synop. N. A. Syrph., p. 233.
1926. *Xylotomima chalybea* Shannon, Proc. U. S. Nat. Mus. 69:16.

One female, Eitzen, May 24, 1936 (Robert Cottrell).

Heliophilus curvipes satanica (Bigot)

1883. *Xylota satanica* Bigot, Ann. Ent. Soc. Fr., ser. 6, 3:546.
1886. *Xylota curvipes* Williston, Synop. N. A. Syrph., p. 232.
1926. *Xylotomima curvipes* var. *satanica* Shannon, Proc. U. S. Nat. Mus. 69:17-18.

One male, Cook County, Cascade River, August 14, 1922 (H. H. Knight); one female, Cook County, August 2, 1928 (L. W. Orr); one female, Itasca Park, June 23, 1933 (R. W. Dawson); one female, Itasca Park, June 15, 1928 (L. W. Orr); one female, Itasca Park, June 24, 1928 (L. W. Orr); one female, Le Sueur County, Fish Hatcheries, July 20-30, 1922 (Wm. E. Hoffmann); one female, Lake County, July 7, 1921 (A. A. Nichol).

Heliophilus ejuncida (Say)

1824. *Xylota ejuncida* Say, Amer. Ent. 1:15-16.
1886. *Xylota ejuncida* Williston, Synop. N. A. Syrph., pp. 229-230.
1926. *Xylota ejuncida* Shannon, Proc. U. S. Nat. Mus. 69:29-30.

Six females, four males; Hubbard, Beltrami, Hennepin, St. Louis, Koochiching, Cass, and Chisago counties; June 16 to August 30.

Heliophilus nemorum (Fabricius)

1805. *Milesia nemorum* Fabricius, Syst. Antl., p. 192.
1886. *Xylota nemorum* Williston, Synop. N. A. Syrph., p. 231.
1926. *Xylotomima nemorum* Shannon, Proc. U. S. Nat. Mus. 69:21.

One male, Olmsted County (C. N. Ainslie).

Heliophilus pigra (Fabricius)

1794. *Syrphus piger* Fabricius, Ent. Syst. 4:295.
1886. *Xylota pigra* Williston, Synop. N. A. Syrph., pp. 227-228.
1926. *Xylotomima pigra* Shannon, Proc. U. S. Nat. Mus. 69:16-17.

One female, Koochiching County, August 14, 1910; one female, June; one male, Itasca Park, June 19, 1936 (C. E. Mickel).

Heliophilus vecors (Osten Sacken)

1876. *Xylota vecors* Osten Sacken, Bul. Buff. Soc. Nat. Sci. 3:69-70.
1886. *Xylota vecors* Williston, Synop. N. A. Syrph., pp. 232-233.
1926. *Xylotomima vecors* Shannon, Proc. U. S. Nat. Mus. 69:18-19.

Three females, one male; Cass, Kittson, and Steele counties; June 18 to July 1.

Citibaena Walker

This genus comprises the group known as the lesser bulb flies, heretofore designated as *Eumerus* spp., which have been known to infest bulbs of various kinds. Since the work of Curtis (1842) and Dufour (1845) who reared *strigatus* (Fallén) from rotten onions, much has been written on the life history, taxonomy, and economic importance of this group. Some of the more recent contributors are Collin (1920), Broadbent (1925), Hodson (1927, 1931, 1932), and Martin (1934). The species are probably all associated with decaying plant tissues; their feeding upon healthy plants is questionable. Recent work of Creager and Spruijt (1935) on *tuberculatus* (Rondani) and its relation to the basal-rot fungi definitely proved this species to be a secondary insect. The fungus is necessary for their normal development. Healthy plant tissue is evidently not an adequate diet for their existence.

Citibaena tuberculatus (Rondani)

1845. *Merodon tuberculatus* Rondani, N. Ann. Sci. Nat. Bologna 4:256.
1928. *Eumerus tuberculatus* Smith, Pan. Pac. Ent. 4:137-139.
1933. *Eumerus tuberculatus* Latta and Cole, Mon. Bul. Dept. Agri. Calif. 22(2-3):142-152.

Five females, seven males, Winona, Ramsey, and Hennepin counties; June 28 to October 26.

Syritta St. Fargeau and Serville

The larvae of the members of this genus are known to inhabit decaying plant and animal matter. The principal workers are: DeGeer (1776), Beling (1882), Metcalf (1916), Smith (1923), and Efflatoun (1922). Particular mention should be made of Krüger's thorough investigation on *pipiens* (Linné). He described in great detail the external and internal anatomy of the larvae which had been collected in stagnant water.

Syritta pipiens (Linné)

1758. *Musca pipiens* Linné, Syst. Nat., 10th ed., p. 594.
1886. *Syritta pipiens* Williston, Synop. N. A. Syrph., p. 240.
1926. *Syritta pipiens* Shannon, Proc. U. S. Nat. Mus. 69:11.

Numerous specimens; Chisago, Ramsey, Washington, Rock, Steele, Cook, Hennepin, Marshall, Le Sueur, Olmsted, Norman, Anoka, Pope, Wabasha, Big Stone, Renville, Red Lake, Benton, St. Louis, and Nicollet counties; May 27 to October 1.

Tropidia Meigen

Malloch (1915) described the puparium of *quadrata* (Say), and Metcalf in the following year discovered the larva of the same species in decomposing human excrement. Metcalf was successful in rearing the same species from the egg on excrement and also from rotting potatoes. He described in detail their immature stages.

Key to Species

Face black with gray pollen; abdomen chiefly black ..... *calcarata*
Face brown or black with some yellow; abdomen chiefly red or yellow ..... *quadrata*

Tropidia calcarata Williston

1886. *Tropidia calcarata* Williston, Synop. N. A. Syrph., p. 208.
1926. *Tropidia calcarata* Shannon, Proc. U. S. Nat. Mus. 69:11.

One female, Ramsey County, June 2.

Tropidia quadrata (Say)

1824. *Xylota quadrata* Say, Amer. Ent. 1:14-15.
1886. *Tropidia quadrata* Williston, Synop. N. A. Syrph., p. 207.
1926. *Tropidia quadrata* Shannon, Proc. U. S. Nat. Mus. 69:11.

Numerous specimens; Houston, Norman, Ramsey, Le Sueur, Anoka, Hennepin, Big Stone, Chisago, and Norman counties; May 27 to August 23.

Criorrhina Meigen

The immature stages are little known. Van Roser (1834) found the larvae of *oxyacanthae* (Meigen) in flood refuse. Verrall (1901) believed them to live in the sap of decaying wood. Lundbeck (1916) examined a puparium and reported it similar to *Tropidia*.

Criorrhina verbosa (Walker)

1849. *Milesia verbosa* Walker, List Dipt. Ins. 3:568.
1886. *Criorhina verbosa* Williston, Synop. N. A. Syrph., pp. 211-212.
1925. *Criorhina verbosa* Curran, Kan. Univ. Sci. Bul. 15:144-146.

One female (Otto Lugger). Although this specimen bears no locality label, it probably was taken within the state. As the distribution of this species includes the eastern part of the United States and Canada, I do not hesitate to list it here.

Cynorhina Williston

Little is known of the biology of this genus. Verrall (1901) recorded a female depositing eggs on exuding sap of beech and oak. Greene (1923b) described the puparia of *pictipes* (Bigot) and *umbratilis* (Williston). The former were taken from frass in a dead tulip tree, the latter under similar conditions in a sycamore tree.

Key to Species

1. Fourth and fifth abdominal tergites red ..... *analis*
   Fourth and fifth abdominal tergites black 2
2. Hind femora yellow at base ..... *badia*
   Hind femora black at base ..... *confusa*

Cynorhina analis (Macquart)

1842. *Milesia analis* Macquart, Mem. Soc. Sci. Lille, pp. 139-140 (1841).
1886. *Criorhina (Cynorhina) analis* Williston, Synop. N. A. Syrph., p. 214.
1925. *Cynorhina analis* Curran, Kan. Univ. Sci. Bul. 15:135.

One male, St. Paul, University Farm, May 19, 1922 (Wm. E. Hoffmann); one female, Olmsted County (C. N. Ainslie); one female, Eitzen, May 23, 1936 (C. H. Yen).

Cynorhina badia (Walker)

1849. *Xylota badia* Walker, List Dipt. Ins. 3:559.
1886. *Criorhina (Cynorhina) intersistens* Williston, Synop. N. A. Syrph., p. 212.
1925. *Cynorhina badia* Curran, Kan. Univ. Sci. Bul. 15:133-134.

Williston records this species from Minnesota, but it is not represented in the collection of the University of Minnesota.

Cynorhina confusa (Johnson)

1913. *Blera confusa* Johnson, Ent. News 24:294-295.
1925. *Cynorhina confusa* Curran, Kan. Univ. Sci. Bul. 15:134-135.

One female, Itasca Park, May 31, 1935 (C. E. Mickel); one female, Hennepin County, May 21, 1925 (C. B. Philip); one male, Lake Itasca (S. A. Graham).

Somula Macquart

The developmental stages of these species are little known. Greene (1918) described the larva and puparium of *decora* Macquart from a specimen taken from a cavity of a living tulip tree. It was typically a rat-tailed type.

Somula decora Macquart

1847. *Somula decora* Macquart, Mem. Soc. Sci. Lille (Suppl.), pp. 73-74 (1846).
1886. *Somula decora* Williston, Synop. N. A. Syrph., pp. 216-217.
1925. *Somula decora* Curran, Kan. Univ. Sci. Bul. 15:162.

Four females, Ramsey, Houston, and Hennepin counties; May 21 to June 30.

Temnostoma St. Fargeau and Serville

The larvae have been taken from decaying wood. Their biology has been treated by Meigen (1822), Barber (1913), Metcalf (1933), and Stammer (1933).

Key to Species

1. Gray or yellow stripe on transverse suture interrupted; yellow triangular spot immediately anterior to scutellum ..... *alternans*
   Stripe on transverse suture entire; single spot anterior to scutellum absent 2
2. Abdomen with three or four yellow transverse bands of nearly equal width, entire ..... *trifasciata*
   Abdomen with transverse bands variable, first two usually interrupted, yellow entirely enclosing black on fourth and fifth tergites ..... *apiforme*

Temnostoma apiforme (Fabricius)

1794. *Syrphus apiforme* Fabricius, Ent. Syst. 4:300.
1886. *Temnostoma aequale* Williston, Synop. N. A. Syrph., pp. 253-254.
1931. *Temnostoma apiforme* Curran, Bul. Amer. Mus. Nat. Hist. 61: 73.

One male, Lake Itasca, June 21, 1921 (H. L. Person).

Temnostoma alternans Loew

1864. *Temnostoma alternans* Loew, Berl. Ent. Zeit. 8:68-69.
1886. *Temnostoma alternans* Williston, Synop. N. A. Syrph., p. 252.
1931. *Temnostoma alternans* Curran, Bul. Amer. Mus. Nat. Hist. 61:73.

One female, Cass County, July 1914 (O. W. Oestlund); one female, Itasca Park, June 21, 1921 (H. L. Person); two females, Itasca Park, June 25, 1921 (H. L. Person).

Temnostoma trifasciata Robertson

1901. *Temnostoma trifasciata* Robertson, Can. Ent. 33:285.
1931. *Temnostoma trifasciata* Curran, Bul. Amer. Mus. Nat. Hist. 61:72.

One male, Grand Rapids, July 7, 1935 (C. E. Mickel, H. S. Telford) on *Angelica;* one female, Itasca Park, July 15-30, 1935 (A. C. Hodson); one female, Ely, June 11, 1936 (R. H. Daggy).

Spilomyia Meigen

Very little is known of their biology. Sack (1932) reported the larvae in the decaying wood of a hollow tree.

Key to Species

1. First and second abdominal tergites black, third with posterior yellow bands ..... *fusca*
   Second abdominal tergite with one or two yellow bands 2
2. Scutellum with yellow posterior margin; anterior corners of first abdominal tergite yellow ..... *longicornis*
   Scutellum black; first abdominal tergite black ..... *quadrifasciata*

Spilomyia fusca Loew

1864. *Spilomyia fusca* Loew, Berl. Ent. Zeit. 8:67.
1886. *Spilomyia fusca* Williston, Synop. N. A. Syrph., pp. 246-247.
1931. *Spiloymia fusca* Curran, Bul. Amer. Mus. Nat. Hist. 61:71.

One male, Beltrami County, August 1, 1910; one female, Lake Itasca, July 28, 1914 (S. A. Graham); one female, Chisago County, July 15 (O. W. Oestlund); two males, one female, Cook County, August 5, 1936 (R. W. Macy).

Spilomyia longicornis Loew

1872. *Spilomyia longicornis* Loew, Berl. Ent. Zeit. 16:82-83.
1886. *Spilomyia longicornis* Williston, Synop. N. A. Syrph., p. 245.
1931. *Spilomyia longicornis* Curran, Bul. Amer. Mus. Nat. Hist. 61: 71.

One male, Ramsey County, August 27, 1922 (A. A. Nichol); one female, Hennepin County, August 27 (O. W. Oestlund).

Spilomyia quadrifasciata (Say)

1824. *Paragus quadrifasciata* Say, Long's Exped. App., pp. 377-378.
1886. *Spilomyia quadrifasciata* Williston, Synop. N. A. Syrph., p. 248.
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Numerous specimens; Cass, Chisago, Roseau, Clearwater, Cook, Hubbard, Anoka, Olmsted, Hennepin, Ramsey, Blue Earth, and Goodhue counties; June 25 to September 10.

Brachypalpus Macquart

The immature stages are known. Bremi-Wolf (1846) mentioned the larvae of *valgus* (Panzer) in decaying willows. The stages of *oarus* (Walker), our only North American species, are well known. Keen (1884) reared the larva which was taken

from loose bark on a stump of a tree. Parker (1915) described the puparium, having found it under moss. Malloch (1915) and Heiss (1938) also described the larva and puparium. Mr. Rodney Dodge collected numerous puparia of the same species near St. Paul from a decaying stump which was inhabited by ants. This is the first account of the members of this genus being associated with ants, but it is probably an incidental occurrence.

Brachypalpus oarus (Walker)

1849. *Xylota oarus* Walker, List Dipt. Ins. 3:558.
1872. *Brachypalpus frontosus* Loew, Berl. Ent. Zeit. 16:83.
1886. *Brachypalpus frontosus* Williston, Synop. N. A. Syrph., p. 221.
1926. *Brachypalpus oarus* Shannon, Proc. U. S. Nat. Mus. 69:25.

Ten males, one female, Coon Creek, near St. Paul, April 27, 1936 (Rodney Dodge) reared from pupae taken from decaying log infested with *Camponotus;* one female, Cass Lake, May 23, 1936 (R. H. Daggy).

CERIOIDINAE

Cerioides Rondani

The larvae are frequently found in the exuding sap of ulcerated trees. The immature stages and biology have been treated by Van Roser (1834), Léon Dufour (1847), Bhatia (1931), Heiss (1938) and others.

Cerioides abbreviata (Loew)

1864. *Ceria abbreviata* Loew, Berl. Ent. Zeit. 8:75.
1886. *Ceria abbreviata* Williston, Synop. N. A. Syrph., p. 261.
1925. *Cerioides abbreviata* Curran, Kan. Univ. Sci. Bul. 15:40-42.

One male, Eitzen, May 23, 1936 (C. H. Yen).

ADDENDA

Since the preparation of the manuscript the following Minnesota species collected by Mr. H. E. Milliron have been added: *Brachyopa notata* Osten Sacken, *Epistrophe mentalis* Osten Sacken, *Eristalis rupium* Fabricius, *Pipiza femoralis* Loew, *Sphecomyia vittata* (Wiedemann), and *Sphegina campanulata* Robertson.

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